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Frances Burney
WFN - Ft. Collins

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Effects of Clearcutting and Timber Management on Sitka Black-Tailed Deer: A Report to the Forest Service

By William M. Longhurst and W. Leslie Robinette

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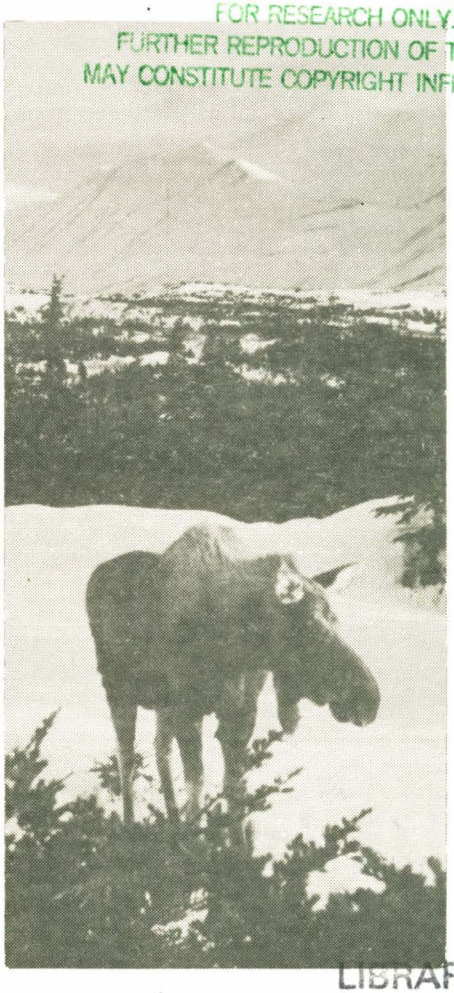

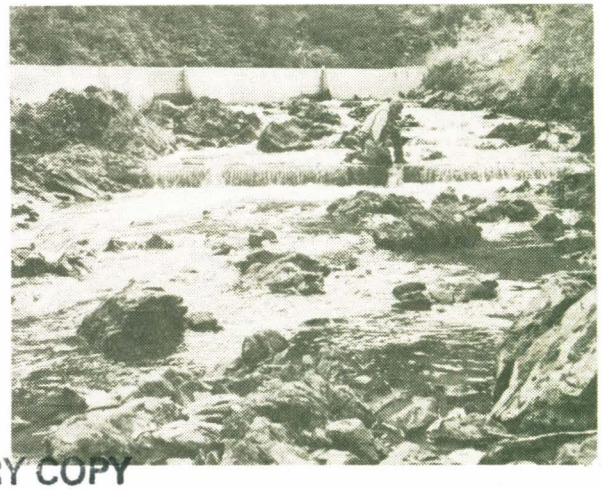

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EFFECTS OF CLEARCUTTING AND TIMBER MANAGEMENT ON SITKA BLACK-TAILED DEER.

A REPORT TO THE DEPARTMENT OF AGRICULTURE,
U.S. FOREST SERVICE, JUNEAU, ALASKA

By

William M. Longhurst
W. Leslie Robinette

October, 1981

FOREWORD

John Muir said something to the effect that when we try to examine anything by itself, we find it hitched to everything else in the world. So it is with natural resources that are found on or associated with a single geographic area. Forest, wildlife, fish, minerals, water, and the like, all have interdependencies that are usually only partially understood. As competition for the natural resources increases, so also does the difficulty in managing them increase, and we rarely have enough information to fully guide our management decisions.

In 1979 the Forest Service was faced with critical decisions, as part of the planning process under the National Forest Management Act (NFMA), about how to manage the Tongass National Forest for wood, wildlife, anadromous fish, and other values. Of special concern were the interrelationships between old growth spruce-hemlock forests and wildlife, especially Sitka black-tailed deer. Research demonstrated some circumstances where deer depended on old growth forest for critical winter habitat, and as often happens in research, the work gave rise to myriad additional questions to be studied. But the NFMA does not provide the luxury of delaying forest planning until we have learned everything we wish we knew.

To provide objective, independent guidance on the state of knowledge on forest black-tailed deer relationships, we asked two respected scientists from outside the Forest Service to "look over our shoulder" a bit, and give us the benefit of their insights. This report is their report to us. We hope it will be useful to others as well. We are grateful to the authors for their efforts, and for their willingness to work with us.

JOHN A. SANDOR
Regional Forester

ROBERT L. ETHINGTON
Director, Pacific Northwest
Forest & Range Experiment
Station

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for Wildlife and Fish Habitat Management in the 1980's

SUMMARY

Although timber utilization in the Tongass National Forest has been going on for a long time (by aboriginal people and later during the Russian occupation), it was not until significant clearcutting commenced after World War II that severe impacts to wildlife occurred.

In our assessment of the deer habitat problem, we agree generally with the findings of a number of investigators that Sitka black-tailed deer are very dependent on old-growth mixed age forests for survival during severe winters. Likewise, deer use old growth forests more than cut-over areas throughout the year. Second-growth forests from about 20-150 years of age are so dense that practically no deer forage is produced beneath them. Timber harvest plans call for the second cut on these stands to occur in about 90-125 years. Therefore, once an area has been clearcut, it will not produce significant amounts of deer forage except for a few years following each cut.

Cutting is progressing at approximately 18,000 acres per year; eventually nearly 2,000,000 acres will be removed from deer forage production. The resulting accumulation of young-growth stands--which are sterile from the standpoint of forage production--is of concern to wildlife biologists.

A start has been made to determine the relative amounts of deer use in different forest age classes. Additional study will be necessary, however, to enable managers to predict the effects of clearcutting and consequent reduction in carrying capacity for deer in commercial timber stands of the Tongass National Forest.

Considerable public controversy has arisen over this issue not only concerning the impact on deer but the potential effects on other game and non-game species as well. Our review covers the various aspects of the controversy.

In view of the congressional mandate included in the Alaskan Lands Bill of 1980 to cut some 450 million board feet of timber annually, and the directive from the Chief of the Forest Service covering "Policy, goals, and objectives for wildlife and fish habitat management in the 1980's", it will be necessary for the Forest Service to reconcile the competing land uses. To accomplish this, it will be imperative to gather the biological data required to predict the impact of timber harvest on the whole spectrum of wildlife. Once this capability is achieved, planning can procede for carrying out the directive from the WO cited above (appendix IV) for habitat management. We have also several suggestions concerning research and management procedures. At present we consider that efforts to mitigate the effects of clearcutting by thinning, clearcutting in small patches, etc. need much more testing. Their cost effectiveness is also in doubt.

In conclusion, we believe that timber harvesting will probably reduce the carrying capacity of the Tongass National Forest for some species of wildlife, including deer, and at the same time improve conditions for other species. We do not feel that any species will be threatened with extinction but at least with more biological information at hand, administrators, managers, biologists and the public will have a better idea what to expect.

INTRODUCTION

We were contacted in late 1979 by Dale Jones, Director of Wildlife and Fisheries Management of the Washington Office of the Forest Service and asked to undertake a brief on-site review of the problems in Southeast Alaska involving the effects of clearcutting and associated timber management practices on Sitka black-tailed deer. Details of our review were finalized by John A. Sandor, Regional Forester, Region 10, Juneau, Alaska, and Kenneth H. Wright, Assistant Director, Pacific Northwest Forest and Range Experiment Station, Portland, Oregon.

We made two visits to southeast Alaska: (1) An initial trip to Juneau and Petersburg from February 3-8, 1980, for planning purposes and to observe winter snow conditions, and (2) a more extended tour over parts of the Tongass National Forest from July 4-August 15, 1980. Details of our itineraries and a list of persons contacted are given in appendices I and II. We have also reviewed a substantial portion of the reports and published literature pertinent to our assignment.

As a result of our discussions with Forest Service and Alaska Department of Fish and Game personnel during our February visit to Juneau, we were asked to broaden our review to include a wider spectrum of issues involved in timber/wildlife relations. Specifically, we were asked to:

1. Evaluate the relationship of timber management to habitat for black-tailed deer in southeast Alaska, based on the present state of knowledge and observations during the study period.

2. Identify how these relationships bear on other forest and wildlife management goals and objectives.

3. Prepare alternative recommendations for applying present knowledge of deer-forest relationships to management practices.

4. Identify new or additional knowledge that needs to be developed through research.

A draft copy of our report was submitted to the Regional Forester on August 15, 1981, and briefly discussed with his staff. Copies of this draft were circulated for comment and we received written critiques from a number of Forest Service and Alaska Department of Fish and Game personnel as well as private individuals. We have used these comments wherever possible to augment, refine, and document our report and they are also summarized in appendix III. Original copies of the comments received are to be held on file at the Forest Service Regional Office in Juneau for reference purposes.

We have not attempted to restate the positions of all of the various agencies, groups, and individuals which have taken stands on the issue of timber harvest and its effects on wildlife in the Tongass National Forest, but we do refer to the principal position statements and give our views on them. We have also included the Forest Service statement for policies, goals, and objectives for wildlife and fish habitat management in the 1980's and have included a list of references, data, and sources particularly germane to this topic.

As a result of our brief field experience on the Forest and our attempt to read and digest the reports and literature available to us, we have reached the conclusion that the field time allocated for this undertaking has been far too short for a thorough, indepth review. At best, this is a superficial report and we hope that it will be accepted in that light.

Acknowledgements

Many persons contributed generously of their time, knowledge, and expertise to this study. Without their help it would not have been possible to plan our itinerary, make the right contacts, assemble the necessary reports and background literature, and visit the pertinent field sites to give us an on-the-ground perspective.

From the Forest Service, we appreciate the efforts of John Sandor, Ken Wright, Don Schmiege, and Sig Olson who helped us develop our work plan and itinerary and the district supervisors at Ketchikan, Petersburg, and Sitka and their staff members; the Alaska Department of Fish and Game staff and game biologists; and the Juneau staff members at the Regional Office, including Jan Albayalde, Wildlife and Fisheries Division Secretary, whose excellent assistance enabled us to have printed copies of the draft report for the discussion at the Regional Office on August 15, 1980.

We also appreciate the efforts of those who reviewed the draft report and submitted written comments. Their efforts have enabled us to prepare a final report which has better balance and considerably more detail than the original draft.

THE DEER HABITAT PROBLEM: AN ASSESSMENT 1/

Utilization of the timber reasource on the Tongass National Forest has been going on for a long time. The minimal impacts of aboriginal people inhabiting the area before initial Russian settlement produced negligible effects. Likewise, Russian use of timber beginning at the end of the eighteenth century, although quite intensive locally, was limited in extent. Even subsequent "high-grading" of select trees from much of the beach frontage throughout the islands and along the mainland shore probably had only minor effects on wildlife. It was not until significant commercial clearcutting commenced in the late 1940's and early 1950's that impacts on wildlife began to be recognized.

According to McKnight (1979) the first formally reported deer studies in southeast Alaska were done by Olson in 1951. McKnight (1979) also points out that Merriam was probably the first to begin investigations of the impacts of clearcut logging (beginning in 1964) and later the depths of snow accumulation in timbered and open areas (Merriam 1965a).

Several subsequent studies have further refined understanding of the interactions between old and second growth timber and black-tailed deer, both the Columbian and Sitka races, in areas subjected to severe winters and deep snow (Bunnell 1979, Rockelle 1980, Schoen and Wallmo 1979,

1/ Because the relationships of deer to timber management encompass many of the considerations pertinent to other wildlife species we use our discussion of the deer problem to introduce our comments on other aspects covered in this review.

Wallmo and Schoen 1980, Schoen 1978, Schoen, Wallmo and Kirchoff 1979, Bloom 1978). Their findings have indicated that the quality of winter range is critical to survival of these races of deer, particularly during severe winters. The best combination of factors for winter deer survival exists under mature, uneven-aged timber stands, especially in highly productive, well drained timber sites. Such benefits from mature timber are apparent from the northern portion of Vancouver Island in British Columbia (Bunnell 1979) northward to the limit of the natural distribution of Sitka black-tailed deer in the Tongass National Forest. Similar effects have also been noted in Washington in the Olympic National Forest (Taber and Raedeke 1980).

Several important benefits of old-growth forests for deer have been pointed out by various investigators. In stands over 150-300 years of age, enough tree mortality has occurred to cause the canopy to open up and allow light to penetrate and stimulate growth of understory forage plants. Food production has been shown to be superior under these overmature stands of timber with a so-called "fine grained matrix" of uneven-aged trees (Wallmo and Schoen 1980). Alaback (1979) has pointed out that shrubby vegetation was best developed wherever small openings occurred.

Whenever snow is present in significant depths, the old growth forests provide much better interception with their well developed stiff limbs, compared to younger conifers. This allows deer to forage under such stands except in the most severe winters. Deer have better access to forage, both browse and forbs, under old growth than in cut over areas and openings where snow accumulates, and they do not expend as much energy searching for food and moving through deep snow drifts.

Rochelle (1980) has shown the value for deer of the arboreal macrolichens which grow most abundantly in old growth forests. The lichens are a dependable food supply with production independent of deer density, and when snow is present, they are more available than low-growing, rooted food plants. These lichens, although low in protein, are high in digestible carbohydrates. Rochelle's in vitro analyses indicate that they also enhance the microbial fermentation of other forage synergistically when consumed in a mixed diet.

One of the best reviews of the relationship of deer to old growth forest that we have encountered is by Hanley (1981). This is discussed in more detail in the planning section.

In spite of the relative benefits for deer in old growth hemlock-spruce forests compared to cutover areas and second-growth timber, such areas are still not adequate habitat during the deep and persistent snow packs which build up in severe winters. Under these conditions, catastrophic die-offs occur to the point that some biologists (McKnight, draft review comments) fear for the survival of the Sitka subspecies, especially if extensive clearcutting compounds the problem.

Clearcutting removes winter habitat, and until the deer population is lowered to adjust to the reduced carrying capacity, more deer are crowded into the remaining old growth forest. The intraspecific competition resulting from this type of concentration often puts an untenable burden on the understory forage and further lowers the carrying capacity.

For the first year or two following clearcutting in southeast Alaska, relatively little deer forage is produced, but regrowth of shrubs, forbs, grasses, broadleaf trees, and conifer seedlings is typically rapid. Shrubs tend to dominate until about 8-10 years after cutting when the young conifers overtop the shrub layer. After 15-20 years the trees have shaded out most of the understory forage (Harris and Farr 1974).

The period of increased deer forage production in clearcuttings is brief and the availability of forage is limited to seasons when snow does not prohibit access. Even though some understory forage may persist as long as 30 years after cutting, deer access is often made more difficult by slash residue left from logging and dead limbs of understory shrubs which have been shaded out (Harris 1974).

Wallmo and Schoen (1980) estimate that from about 30-40 up to 150 years, the conifer stand has relatively little understory vegetation with little or no deer forage production. Robuck (1975) indicates this condition may persist more than 200 years. Forest managers consider that second growth stands of spruce and hemlock should be harvested at about 100 years of age (Harris and Farr 1974). It is, therefore, apparent as stated by Wallmo and Schoen (1980) that deer "carrying capacity would remain at a depressed level perpetually with modest increases for a few years, perhaps after each cutting."

According to Schoen (draft review comments) some 80% of the cutting cycle in second growth stands is dominated by these sterile conditions for understory growth. As cutting progresses, according to John Sandor, Regional Forester, (letter to the Alaska Game Board, July 29, 1980) at the rate of less than 20,000 acres a year, at the end of a planned 100-year cycle nearly 2 million acres will have been cut in Tongass National Forest.

From the standpoint of timber production, it makes sense to convert old growth timber stands to even-aged, highly productive second growth. The accumulation of more and more of the best winter deer habitat in this sterile forage status is of concern to wildlife biologists, however.

We accept the general conclusion of the dependence of deer on old growth forest for survival in severe winter. We do not, however, believe that studies have progressed sufficiently to provide the degree of predictive capability necessary to estimate impacts of clearcutting on wildlife throughout the Tongass National Forest We are supported in this view by Hanley, who subsequent to our draft report, prepared a problem analysis of "Big-Game Forest Management Relationships in southeast Alaska: (Hanley 1981). He states, "Our current ability to predict the ecological consequences of site-specific management practices and to plan management in terms of wildlife objectives leaves much to be desired."

The investigators involved in these studies on the Tongass Forest are very aware of the ecological variability in the forest. During our own limited observations, we have seen sufficient variation among habitats to lead us to believe that significant numbers of deer now exist in locations where their access to high quality, old growth forest is limited or nonexistent. Recent winters (since 1971-72) have been mild, however, and survival has not been tested severely. We do not disagree with the data which point to the positive correlation between forest site productivity and timber stand condition and concentration of deer use. Nor do we dispute the concept that deer survival in severe winters is directly related to the amount of high site old growth forest available. In fact, most deer are undoubtedly dependent on old growth in varying degrees every winter. Deer are extremely adaptable , however, and we believe the next step in assessing the impact of clearcutting is to examine and quantify the environmental and site specific variables involved.

Some of these variables have already been recognized and studied. Others are presently being investigated. For example, Klein (1979) summarizing his earlier work (Klein 1957A) points out environmental differences between coastal islands such as Coronation Island and islands closer to the mainland such as Woronofski. Significant climatic gradients have been identified in the

Alexander Archipelago not only from east to west but also from north to south. We suspect that the relative importance of old growth forest for winter deer survival may decline to the south and west where severity of winter conditions decreases with latitude and proximity to maritime influence. It is clear, however, that sporadic severe winter die-offs of deer are the major factor regulating populations even in the most favorable parts of the archipelago. As we detail in the section on research needs, other physical characteristics of deer habitats also need appraisal.

In order to understand and thereby be able to predict the impacts of clearcutting on deer, we believe the present studies being conducted jointly by the Forestry Sciences Laboratory and the Alaska Department of Fish and Game are an excellent beginning on quantifying the situation. We are also pleased to see that a start is being made on a food habits study and that comparative measurements are being taken of understory vegetation and associated canopy in timber stands of various ages. There are, however, several other facets of the problem which need to be studied. They include: (1) deer nutrition, (2) population dynamics, (3) predation, and (4) effects on utilization of deer for both consumptive and non-consumptive purposes. We cover the details of these requirements under the section on research needs.

To summarize, we feel that more information is necessary before the results of the studies by the Forestry Sciences Laboratory and the Alaska Department of Fish and Game can be applied with equal confidence throughout the Tongass National Forest. The primary objective should be to acquire the capability to predict within specified confidence limits the probable impact of clearcutting on deer populations throughout the array of habitats found in this area. Before we can predict the effects of clearcutting, it will be necessary to classify forest habitat in terms of its importance to deer and other wildlife.

For example, with regard to deer, blocks under consideration for cutting vary in importance as deer habitat depending upon a large array of intrinsic and extrinsic factors. Whether these are adequately defined by the present Forest Ecosystem Classification needs to be determined.

When predictive capabilities are better developed, it should be possible to make a reasonable estimate of what to expect, in terms of deer carrying capacity, from each proposed timber sale. The effects of each sale will, of course, change as the forest regrowth cycle progresses. If mitigating treatments are applied, the projections will be altered. Likewise, if additional timber sales are carried out within the potential home ranges of the deer involved, their impacts will interact with the original sale. At some point in the future it should be possible to make these same kinds of predictions for other wildlife species as well.

MULTIPLE-USE CONSIDERATIONS

Whether enough of the adverse impact of clearcutting on deer forage can be mitigated through such measures as judicious thinning, strip or small "patch" cutting of second growth stands to approximate conditions found in mixed-age old growth is still unknown. The cost effectiveness of these procedures is also questionable and requires much further investigation. Additional costs in terms of deferred potential timber production from old growth timber stands, which are retained uncut for wildlife habitat, are likewise incurred.

Timber harvest of some 450 million board feet each year has been authorized by Congress in conjunction with the Alaskan Lands Bill signed by President Carter. In order to harvest this volume of timber it has been estimated that it will be necessary to cut approximately 18,000 acres of forest each year. Previous statutes charge the Forest Service with management of National Forests for multiple use including adequate provision for all wildlife species (appendix IV).

Forest Service managers have a considerable challenge to successfully reconcile these diverse mandates. At present a number of interested groups, agencies, and individuals have used these preliminary findings of the Forestry Sciences Laboratory and Alaska Department of Fish and Game studies on the differences in deer pellet counts in old growth forest and clearcuts as a basis for disputing the wisdom of proceeding with further timber cutting plans on the Tongass Forest. Among others, opposition has been expressed by the Alaska Department of Fish and Game, the Alaska Board of Game, and the Alaska Chapter of the Wildlife Society. A more complete list of those concerned about timber cutting practices is given in the public responses expressed in the Alaska Lumber and Pulp, 1981-1986 Timber Sale Operating Plan, Final Environmental Impact Statement, U.S. Forest Service Alaska Region Report No. 100, Part I, (USDA 1980). On the basis of the information available to them, these people have reason to be concerned about the probable impacts of timber harvest on wildlife; and we conclude the Forest Service has a definite credibility gap with certain members of the public.

Perhaps the term "credibility gap" is not entirely appropriate. A knowledgeable reviewer of our draft report feels that the problem appears to be a lack of confidence in the Forest Service and an unwillingness on the part of people to believe the information the agency disseminates. While the Forest Service has not withheld information on the effects of timber harvest on wildlife, it has not had adequate data to predict and quantify these effects. As a result, information released to the public has often been too vague and imprecise. Results of pellet counts have been inappropriately translated into carrying capacities for deer and this has further added to the confusion.

The Congressional mandates which direct the Forest Service in its management of forest lands stem to a great extent from public pressure. It is important that the public be kept fully appraised of the best available estimates of the probable effects of timber harvest and associated management practices in terms of both costs and benefits for wildlife. The cost effectiveness of any management practice designed specifically to benefit wildlife should also be included in these appraisals.

DRAFT REGIONAL PLAN

Note: This plan synthesizes much of the information and objectives of the Tongass Land Management Plan and Southeast Alaska Area Guide and our comments apply equally to them.

Major Public Issues

We feel qualified to comment on only a few issues covered in the Regional Plan:

1. Fish and Wildlife.--It is especially important for the Forest Service to continue close cooperation and liaison with the Alaska Department of Fish and Game.

The maintenance and enhancement of wildlife habitat for game species and furbearers is expensive either in terms of direct costs to mitigate or indirectly if timber production and eventual timber utilization is significantly reduced. Retention areas in old growth stands or clearcuttings in second growth would both reduce potential timber production and it makes little economic sense to bear such costs if the exploitable wildlife produced through such activities is not utilized efficiently, primarily for consumptive purposes. Needs for non-consumptive uses of wildlife can generally be satisfied with fewer numbers than required for consumptive uses.

It is our distinct impression that the Alaska Department of Fish and Game has generally been overly conservative in allowing hunters to harvest wildlife on the Tongass National Forest. Natural losses, particularly during winter, could be reduced by heavier hunting. Seasons and bag limits appear to be set

intuitively or in response to public pressures rather than from sound inventory information.

The need for better inventory information on big game to facilitate management decisions is recognized by the Alaska Department of Fish and Game. As they point out, however, in many situations the effort required to gather such data has not been worth the cost and the agency has therefore had to rely upon the best biological judgment available. In our estimation this is not an unreasonable approach, and to one degree or another most states are faced with the same problem. We merely urge that better information be acquired as rapidly as possible.

Fish and Game personnel also point out that seasons and bag limits are set by the Game Board by balancing biological input and public desires. Again, most other states do the same thing. Our comment is that we hope that Alaska Department of Fish and Game will continue to lead the public along the path of sound wildlife management based upon the best field and research information that can be obtained. We have seen too many states fall into a trap where their management proposals are stymied by public opposition because they followed rather than led the public to accept biologiclly based management.

These comments apply especially to management of deer, moose, and black bears, and we wonder about mountain goats, brown bears, and furbearers as well. Certainly better data on carrying capacities and population dynamics of these species will provide a sounder basis upon which to judge their exploitable surpluses and to set hunting and trapping regulations.

2. Wilderness and Roadless Areas.--Considering the remote and inaccessible nature of much of the Tongass National Forest, we feel there is less need there than elsewhere to formalize wilderness areas for protection of wildlife habitat. Better access by water, air, and road is the primary need to make available a greater portion of the Forest to more people at reasonable cost. Charter costs for boats and planes are beyond the means of many people.

3. Wildlife Utilization.--At present, even with the relatively generous seasons and bag limits, hunting is not controlling deer populations in most areas. Natural loss factors appear to be the dominant restriction on deer numbers. Better access for hunters would aid more efficient utilization of the deer resource. Unless the number of hunters increases several fold, however, it is unlikely hunting can fully utilize the surplus from deer herds except in the most accessible areas close to centers of human population.

If a choice is available, areas with a high potential for wildlife should be dedicated close to centers of human population where utilization for either consumptive or non-consumptive purposes is more easily achieved. Remote areas with equivalent wildlife potential might be given lower priority and in such situations the balance could well be shifted toward timber production.

We fully appreciate the possibility of adverse impacts that can accompany increased human access, but on balance we believe careful regulation and management of human activities will minimize these risks and achieve a better distribution of benefits to the public as a whole.

4. Community Economic Stability, Social Well-Being, and Recreation Opportunities.--Better, more efficient use of wildlife resources will provide a positive contribution to all of these issues. Both consumptive (hunting) and non-consumptive (viewing, photographing, aesthetic appreciation) uses of wildlife will contribute to the tourist and recreational segments of the economy. More people will be provided recreational opportunities and as a result of these improvements social well-being will be enhanced.

Example: From what we have seen, one of the best opportunities we saw to increase wildlife use which would achieve a broad range of the objectives listed above is on Prince of Wales Island. Most of the island is designated in LUD III and IV

categories. There is a good start toward a permanent road system and ferry access is available. Careful planning and liaison with native corporations could dovetail objectives and use of National Forest and native lands for mutual benefits from increased recreational use of the island. Greater wildlife utilization could be an integral part of such a plan. Native corporations should be encouraged and provided information on full use of wildlife and fish stocks not only for subsistence purposes but also for income from the visitor trade.

On Prince of Wales Island the forage resources, particularly the winter ranges in old growth timber, have been rested by several years of low deer populations and the potential for increase of deer exists. The difficulties of wolf control under the conditions which exist in southeast Alaska have been pointed out to us. Nevertheless, even though wolf numbers are at present reportedly low in this area, if some way could be found to reduce wolves following a severe winter loss of deer, it would speed the recovery of deer numbers (McKnight, Alaska Department of Fish and Game, review comments).

Black bear are also thought to be quite efficient deer predators, and they are numerous in the area. Some observers believe that they may have been even more abundant in former years. Although seasons and bag limits on black bear are generous, it is doubtful that sport hunting is sufficiently effective to actually reduce numbers to the point that deer might benefit, except possibly on some of the smaller islands.

In general, predator control is usually not a very efficient means of increasing deer numbers (Connoly 1981). Before substantial efforts are expended for this purpose in southeast Alaska, the cost effectiveness of such a program should be evaluated.

As pointed out earlier the forage resource, especially winter ranges, have been rested by several years of low deer populations and the potential for substantial increases of deer exists. Wolf control under southeastern Alaska conditions is difficult at best, but it could be tried and if it is successful, effects should be monitored to evaluate deer herd recovery. Black bear hunting could certainly be intensified. The value of increased predator removal should logically be coupled with the most efficient utilization possible of deer populations.

WILDLIFE MANAGEMENT NEEDS

Policies, Goals, and Objectives

In 1980 the Forest Service developed a set of policies, goals, and objectives for wildlife and fish habitat management as a part of the Resources Plannning Act Program (USFS 1980). Because of the pertinence of this document to our assignment, it is included as appendix IV.

We wish to draw attention to the need for close cooperation and liaison of the Forest Service with both state agencies and private individuals. In southeast Alaska it is obvious that this should include the State of Alaska, and in particular the Alaska Department of Fish and Game and the native corporations as well. Other private land holders who control significant blocks of land harboring wildlife should also be included.

We believe that now may be an appropriate time to restate and redefine the policies, goals, and objectives for wildlife management as they apply to Region 10. As stated in the Southeast Alaska Area Guide, the Tongass Land Management Plan, and the draft of the Regional Land Management Plan, goals have been refined and have become more realistic but in our judgment are still not sufficiently specific. For example, a clearer definition of multiple use and the relative priorities of various uses would be helpful. Likewise, acknowledgment that all uses cannot be carried out on the same site would help clarify the objectives of timber management for the public.

The potential impacts of cutting timber on wildlife need quantification and if present knowledge is adequate for

quantification by species, a statement should be made to this effect. However, if quantification is not possible, now or in the future, the fact should not be glossed over. We understand that the Forest Service program on wildlife habitat-relationships which is being developed is designed to clarify this situation.

Timber Cutting Goal

Depending on whom we talked to, we heard conflicting views about whether the goal of a sustained yield of 450 million board feet can actually be achieved from an annual cut of approximately 18,000 acres. Without going into all of the arguments pro and con on this issue, we believe that whatever the realistic figure, it will need periodic reappraisal. Much of the wildlife planning will revolve around this point.

Additionally, the situation would be clarified if the following questions could be addressed in the Regional Plan. Will retention areas for deer and other wildlife be permanent or will they be reevaluated and possibly cut on the next entry or 5-year sale? Are most or all contingency cutting areas going to be cut eventually, and if they are cut and if there is still not enough timber to satisfy the 50-year contracts plus independent sale commitments to the Small Business Administration, what then? What planning has been done for additional contingency cutting areas if they are needed? Will timber cutting goals be reduced if the supply is short and if so, will reduction apply to both long-term contracts and independent sales? Is there any latitude on these points? If so, wildlife planners as well as those in other disciplines need maximum lead time to adjust their planning. State agencies as well as the concerned members of the public also need to be kept informed if Forest Service management practices are to be credible.

Moose Habitat

Based on the Thomas Bay study by Doerr et al. (1980), it is evident that this moose population is not existing in high quality habitat. Evidently the lack of extensive stands of willow and black cottonwood, two key browse species, are a major contributing factor. These investigators conclude that clearcutting of timber has improved the overall carrying capacity for moose, in this area, but also indicate that moose make extensive use of old growth timber when clearcuts are covered by deep snow. The forage moose obtain from understory of old growth timber such as evergreen forbs, however, does not appear to benefit them as much as it does deer. Moose also are reported to make more use of older clearcuts than deer and most sign was observed in cuts 8-19 years old. Cuts less than 8-years old were reported to be avoided.

Doerr et al. (1980) suggest that stands of willow and black cottonwood could be enhanced on river wash sites by noncommercial cutting of alder and young conifers. They also recommend clearcutting small patches in second growth timber to improve browse for moose. The evaluation of such practices carried out by E.L. Young, formally with the Forest Service at Petersburg, indicated that their cost effectiveness was questionable. We also believe that moose productivity could be increased through either-sex hunting not only in the Thomas Bay area, but in other southeast habitats. Jack Lentfer, Game Supervisor for the Alaska Department of Fish and Game in southeast Alaska, informed us that either-sex hunting is preferred by the Department but because local hunters prefer bulls only, this system has been continued. The cost-benefit relationship of spending substantial funds for moose habitat improvement and foregoing timber production on river wash sites as suggested by Doerr et al. (1980) should be weighed against the benefits of either-sex hunting. Actually the promise of habitat improvement might help convince local hunters to accept either-sex hunting.

We are aware that if either-sex hunting was to be initiated, it might be necessary to use a permit system due to limited moose numbers. This, of course, increases administrative requirements and restricts opportunities for hunters. It might be possible, however, to continue the open bull season and add a limited number of cow permits.

We received reports of occasional moose sightings on Mitkof, Kupreanof, and Prince of Wales Islands, and we also found the remains of a moose on Sokolof Island during our visit there. But our impression, from talking with knowledgeable people, is that these islands are even more marginal habitat than the pockets where moose occur on the mainland. Efforts to increase the carrying capacity for moose on these islands would therefore have rather low priority but should not be entirely discounted. We feel that any means of increasing the diversity of ungulates throughout southeast Alaska would be worth considering, especially if species can be found with diverse food habits and ecologic niche preferences. Broadening the variety of herbivores has been amply demonstrated in many parts of the world to improve the conversion of vegetation to useful animal products.

Introduction of Elk

For this same reason we believe that further efforts should be pursued to introduce Roosevelt elk to this area. Elk have demonstrated that they can survive the rigorous conditions of Afognak Island and if sufficient numbers could be planted in one area, we feel they would have a reasonable chance of becoming established. An isolated island might be selected for such a trial; Zarembo Island has been suggested as a possible site.

We are also aware of the previous attempts to introduce Roosevelt elk to southeast Alaska, (including Gravina and Revilla Islands). In spite of these failures, we consider it worthwhile to try again.

Before elk introduction is contemplated, however, it would be logical to analyze the potential demand for this species and to assess their probable biological impact on the habitat as well as the possibility of spread to other islands.

Members of the Alaska Department of Fish and Game have expressed strong reservations about the potential for competition between elk and deer and this should certainly be considered. Some background information which would aid the assessment of this aspect should be available from Oregon, Washington, and Vancouver Island where Roosevelt elk and Columbian black-tailed deer coexist.

There is some indication, however, that Roosevelt elk do not compete with deer to the extent that is often found with Rocky Mountain elk and deer. Additionally, Roosevelt elk do cause serious damage by browsing to Douglas-fir seedlings in Oregon and Washington, and it would be necessary to evaluate their preferences for the species of commercal conifers in southeast Alaska. Taber and Radeke (1980) point out that Roosevelt elk do browse on hemlock.

Retention Areas

In the planning process, particularly in the case of timber sales, areas to be retained uncut to meet wildlife needs should be designated as temporary or permanent depending upon management objectives. Beach front areas, because of their critical values for deer winter range, furbearers, and eagles, are among the best examples of sites for permanent retention. In contrast, intermediate elevation sites may or may not require the same consideration for permanency depending upon local conditions. Both temporary and permanent retention areas will lose value and ability to meet their needs if they are altered by unplanned changes in size or design. Blowdown of trees in windstorms is a good example. Ruth and Harris (1979) present a good discussion of the factors contributing to blowdown risks and ways in which risks can be reduced.

Slash Removal

Elsewhere, in this report, we have discussed the advantage of reducing slash in clearcuts to a minimum to facilitate access for deer and humans. Ruth and Harris (1979) indicate that broadcast burning of slash would also aid in removal of dwarf mistletoe seed.

On-site chipping of slash with portable chippers is probably one of the best ways to remove debris. Chips which have commercial value could be transported for processing and unusable materials left on the site to decompose.

Reexamination of Managment Options

During our review we have encountered a few management procedures which may be profitably reexamined to determine whether they are actually the best means of meeting stated goals.

Timber Cutting Schedule

The typical timber cutting plan used in recent sales has been described to us as follows: When entry is made into a new area plans are laid to cut timber on as many of the high production sites as possible, considering risk class, retention requirements, desired clearcut size limitations, economic considerations, and other factors. The main road system is laid out to facilitate the cut with minimum adverse environmental impact and to maximize management for all resources. Often the bulk of the road system for the first and future entries is constructed and paid for on the first entry, although secondary roads may be constructed during later entries. On the first entry, possibly a quarter to a third of the available timber is removed and operations are then moved to another area where a new entry is planned and carried out. On a given area, it may require three or more entries spaced at 15-30 year intervals to harvest all of the available timber. In some situations, however, from 40-60% of the available timber may be cut on the first entry to help pay for road costs.

At this stage of the overall timber management program for the Tongass National Forest, we suggest that it might be worthwhile to reevaluate this sequence and to weigh the many pros and cons of a pattern of cutting designed to harvest all the available timber in one area before moving to a new area. Of course, watershed and fisheries values would have to be considered in such an undertaking.

It would definitely be advantageous to wildlife to defer entry into new areas as long as possible. For many species there is still an inadequate information base to achieve good management and to predict impacts of cutting with sufficient accuracy. If more time is available for research and data acquisition, future planning should improve and better multiple use could be achieved. While we are cognizant of some of the ecological, physical, social, aesthetic, and economic factors which would have to be considered in determining which scheme would be preferable, because of our limited

experience, we would defer judgment on their relative merits to more knowledgeable persons. We merely wish to suggest that a careful review of the options might be profitable. We are also aware that there are clearcut size guidelines specified in the National Forest Management Act which would have to be followed.

An example of complete cutting of all timber available in an area on the first entry is available on the forest such as the Bradfield Canal area, although even there complete cutting was not accomplished because of concerns that adverse biological impacts would result. We are not suggesting that this precise pattern of cutting applied to the Bradfield Canal area should be carried out elsewhere. An on-site comparison with partial cutting on the first entry might be one means of investigating the relative merits of these strategies.

RESEARCH NEEDS

Deer

Forest Relationships

Wallmo and Schoen's research (Schoen 1978; Schoen, Wallmo, and Kirchoff 1979; Schoen and Wallmo 1979; Wallmo and Schoen 1980) has contibuted significantly to our understanding of the value of climax forest to deer, especially during winter. Additional study is needed, however, to explain the relatively light summer use by deer of 4 to 15-year-old clearcuts compared to old growth. Concentration of deer at higher elevations in summer may account for some of the low pellet counts in young clearcuts at low elevations.

How much of the reduced use of young clearcuts can be attributed to inaccessibility? If logging debris is a major factor in reducing deer use, the manager should know it. We saw two of the more recent clearcuts on the Loop Road on Mitkof Island where the debris has been cleared sufficiently that access to deer would have been no problem. We understand that utilization standards have been tightened by the Forest Service so that future clearcuts should have less debris. When pellet group transects are being run through climax timber and adjacent clearcuts, the proportion of each clearcut that is actually accessible to deer use should be determined and pellet group counts should be corrected for relative amounts of accessible area. The results could indicate whether slash disposal would benefit deer and give a better base for estimating deer numbers.

Determinations of relative amount of accessible area for deer are, we believe, an important adjunct to the pellet work which has been done so far. Line intercept plots set up in old growth forest, various age clearcuts, and second growth timber stands could be used to gather this information and would yield more information than line point plots. Once such data were available, small pellet plots (possibly milacre circular plots) could be placed in accessible areas in sufficient numbers to obtain a

reasonably normal distribution of pellet counts (Barrett 1979). It should also be possible to improve the accuracy of estimating numbers of deer from the counts with this approach. Likewise, small plots could be staked and cleared for repeated counting to obtain better information on seasons of use and to reduce possible loss of pellets from decay.

Schoen and Wallmo have shown the deficiencies of clearcuttings as habitat for deer. Snow accumulates more in clearcuttings and may inhibit access to food and increase the energy cost of searching for food. Also, once the conifer canopy closes (about 20 years post cutting), light penetration is insufficient to permit growth of forage plants in the understory. This condition persists until the next rotational cut in about 90-125 years. We agree with the remark by Schoen that suppression of understory vegetation for some 80% of the rotation period is by far the most detrimental consequence of clearcutting. As a result, the accumulation of second-growth stands in these unproductive age classes will in total produce the greatest reduction in food supplies for deer.

We suggest at this point, that further research on seasonal use of clearcuts be concentrated in cuts less than 20 years old and that use should be quantified during snow-free periods as well as during periods of extreme snow depth. The work of Schoen and Wallmo has been carried out during a series of relatively mild winters.

The Forest Service has acknowledged the probable impact of clearcutting and indicates that the cutting program could cause as much as a 35-40% reduction in the number of deer (Tongass Land Management Plan, Part 1, p. E21). But there are so many variables and unknowns that it is very difficult to know what the actual reduction might be. Wallmo and Schoen have reported one-sixth as many pellet groups on clearcuts as they have in adjacent climax forest. The inference that might be drawn from these studies is that if all timber were cut, deer would be reduced to this fraction or less since they would no longer have any winter cover. While we accept their finding that more pellet groups are found in the climax timber, we wonder if their estimate of six times is the best figure. It may be more or less. Pellet counts do not reflect changes in carrying capacity directly on a one to one basis.

Wallmo and Schoen describe no checks for determining if groups of pellets were missed on a single coverage of plots and if so in what magnitude. We have both had considerable experience in pellet group counting and we know that groups can easily be missed, primarily because of heavy ground cover.

Personnel with the South Dakota Department of Game, Fish, and Parks have made an in-depth study of this problem. We believe it worthwhile to review some of their findings. Hart (1961) reported that on some test plots eight observers missed from 25-50% (average 38%) of the known number of pellet groups on a single coverage. In another study, Hart reported that a research team found an additional 14.7% groups on plots which had already been sampled twice by management crews. Hart (1958) suggested that as many as three counts might be necessary in some cover types. By the late 1960's it was standard practice for management personnel to make double counts (Thompson and Hausle 1970). This was done by having two workers count from opposite ends of a stretched tape with each counting a 3-foot strip on opposite sides of the tape, and marking each group they found. When this count was completed, the counters reversed directions and sides of the tape. Hart (1961) verified that the percentage of groups missed with a single count increased significantly with ground cover density. This finding has a definite bearing on Wallmo and Schoen's results since the ground cover of clearcuts, especially during the first 30 years, is much greater than that of climax timber. Despite the high proportion of groups missed with a single coverage in South Dakota, counting conditions there are infinitely easier than what we saw in southeast Alaska. Thought should also be given to possible correction of pellet count data for possible sources of error

such as those which Collins and Urness have found in their work with elk and deer pellet distribution in Utah (Collins and Urness 1979, 1981).

An attempt should be made to refine pellet group counts to provide reasonably accurate estimates of deer density. Two conditions presently exist which stand in the way of this conversion. One is the differential disappearance rate for pellets depending upon exposure and weather condition. The other condition is that there is too much overlap of seasonable deer ranges, i.e., summer use by some deer on normal winter range areas, so that there is no starting point from which to accurately date pellet group deposition.

The areas where Schoen is currently studying home range and seasonal movements of radio-collared deer might present an opportunity for determining deer densities. For those areas it would be possible to determine when deer move onto the winter range from the higher summer range in the fall and off of it in the spring. In many situations, however, deer undoubtedly move up and down slope through the winter following the snowline. We suggest that in one or more of these areas marked plots be established along transects extending from the beach to the upper mean level of winter range. As fall pellet group counts are made, groups should be removed from every other plot. The relationship of spring counts on even and odd-numbered plots would provide a cross check of the disappearance rate for the interval and would be separable by habitat. If pellet group density differed initially on odd and even plots a correction factor derivable from the total counts could be applied to the disappearance rates. Sources of error besides those of sampling adequacy are missed groups, etc. In many situations some deer are resident year-long on the low elevation winter ranges used by other deer which move down in the fall from higher elevations. This will increase the difficulty of intrepreting pellet counts.

During our contacts in the Ketchikan and Petersburg areas, we saw or heard of some possible exceptions to the view that high volume timber is essential to the overwinter welfare of deer. For example, according to Robert Wood, Game Biologist for the Alaska Department of Fish and Game in Ketchikan, Gravina Island has provided Ketchikan hunters with some of their best deer hunting over the past few years--with up to half of the total deer kill. Yet the portion of the island we saw, afoot and from the air, primarily on the north and east sides lacks extensive areas of high-volume climax timber. A thin band of merchantable timber near the beach is backed by extensive areas of muskeg, and we saw one sizeable clearcut.

We were told by Joe Doerr, Wildlife Biologist with the U.S. Forest Service at Petersburg, that Level Island has perhaps the highest density of deer in the Stikine District, yet from our flight over the area it was evident that what had not been clearcut, was muskeg. Sokolof Island, which we visited, has a fair deer population despite a 60% clearcut. We were told that Heceta Island likewise has good deer numbers despite the fact that 40% of the island has been logged and wolves are present. We also understand that deer in certain pockets on Prince of Wales Island are recovering more rapidly from the low of the early 1970's even with the presence of both wolves and black bears.

South of Frederick Sound where wolves and black bears are present, deer have not recovered on sizeable areas of Kuiu and Kupreanof Islands where no cutting has taken place. It has also been pointed out that on these small, relatively flat islands, such as those described above, deer may be particularly vulnerable during severe winters and that the present numbers are unlikely to be sustained for many years.

These examples and perhaps others of which we are unaware stress the need for further research on factors controlling deer densitites. They also indicate that the studies on Admiralty and Chichagof Islands should be broadened to those areas which are more influenced by a maritime climate. It is possible and likely that in areas where the winters are less rigorous, deer are less dependent upon high volume old growth for

survival. In an initial, broad look one should accumulate all relevant data possible for each unit or subunit to be examined. Information on weather (winter snow depth and temperature), island or unit size, history of deer abundance and die-off, influence of hunter kill on the number of deer, relative abundance of predators by species, conditions of winter range as influenced by deer use and/or logging activites, ratio of winter to summer range, elevational differences, etc., should be drawn upon. Data analyses might uncover a set of conditions where one or more factors could be profitably studied.

A start has been made along this line by the Alaska Department of Fish and Game and by the Interdiciplinary Team in preparation of the Tongass Land Management Plan. However, to achieve adequately predictive capability for the impacts of timber harvest and management practices on deer in specific sites throughout the Tongass National Forest, we are firmly convinced that a more comprehensive evaluation will be necessary.

We believe that Wallmo and Schoen's research on the value of old growth timber to deer points up the need for a more detailed study of this vital habitat. What are the optimum conditions for deer in old growth in terms of canopy cover, the tree diameter, height and spacings by species which provide the best mix for forage production and snow interception for deer? The study should also include the influence of aspect and slope on the microenvironments of deer habitat. It is possible that a better understanding of old growth could even produce recommendations for enhancing old growth habitat for use by deer. Selective logging, for example, might, in some instances, prove beneficial by increasing deer forage while maintaining adequate cover.

Another aspect of the differences between understory vegetation beneath old growth timber and the same species found in early age clearcuts is their nutritive value for deer. To us, the results of the investigation carried out by Billings and Wheeler (1979) to test the protein content of Vaccinium in a clearcutting compared to adjacent old growth timber are confusing. Higher protein levels found under old growth timber need better explanation. The authors suggest a possible "dilution" effect related to faster growth in open areas where there is greater competition for nitrogen and where more light stimulated plant growth.

Phenological differences are also apparent between openings and under the forest canopy and may account for the difference in protein content of understory plants. Under the canopy, leaves and berries are retained longer, but browse and berry productivity is less. Whether the longer growing season under the canopy contributes to the protein differences has not been determined. Moisture stress in periods of dry weather also shows up more quickly in open areas.

Our recommendation would be to engage the services of both an experienced plant physiologist and a ruminant nutritionist to investigate these important differences in the quantity and quality of forage plants growing in openings and under canopies and to assess their value for wildlife.

Schoen et al. (1981) have investigated edge relationships comparing deer pellet densities in old growth forest and adjacent clearcuts. Clearcuts less than 1-year up to approximately 15 years of age were sampled in the spring at low elevation in order to measure winter deer use. They detected no significant concentration of deer near the edge either in the forest or the clearcut. Although they mention the possibility of reduced accessibility for deer because of windthrow near the forest edge and from slash in the younger clearcuts and from increased snow depths in all clearcuts, they did not quantify accessibility. As pointed out earlier, corrections are definitely needed to extrapolate pellet count data obtained from transects to estimates of numbers of groups per acre.

More attention should be directed toward developing ways to mitigate the adverse impacts of logging on deer. Out of the home range data presently being collected

by Schoen et al. (1981) should come a concept of least damaging size of clearcuts and better information about how to locate reentry cuts and retention areas. Research on ways of prolonging the forage-producing life of clearcuts for use during snow-free periods should help in determining the desirable number of reentry cuts during a rotational cycle. Studies of other "key" wildlife species should logically be included along with deer investigations.

Our discussions thus far with knowledgeable people suggest that the cost-effectiveness of precommercial thinnings to benefit deer make it a questionable practice at this time. This is especially so when severe winters continue to periodically siphon off surplus deer even in areas having old growth timber. This should not, however, deter researchers from studying ways of prolonging the useful life of clearcuts for forage production for deer during snow-free periods. Preliminary results obtained by Alaback (1979), for example, indicate that varying the spacings in thinnings can influence not only understory volume but species composition as well. These findings may have practical application in deer management.

In naturally regenerated stands considerable variability in tree stocking also exists, and the effects of stocking rates on deer should also be explored. Stocking varies from areas requiring artificial reforestation up to many thousands of seedlings per acre.

Patchcuts have been used for wildlife enhancement, particularly for deer, in other parts of the country and the possible application in second-growth stands on the Tongass should be studied. Not only can they provide additional deer forage, particularly during snow-free periods, but conceivably their size, shape, and orientation might be adjusted to reduce snow accumulation thereby increasing their usefulness to deer. Smith and associates at the Pacific Southwest Forest and Range Experiment Station have investigated ways of increasing snow pack in timber cuts in California. Conceivably their findings might also suggest ways to reduce snowpack. One research suggestion coming from the Sitka office of the Forest Service is for a few patch cuts of 5 to 10 acres to be made on some of the most depleted winter deer ranges near the coast north of Sitka. There are many such areas that now produce little quality deer forage. The rationale is that since these areas are of limited value to deer in their present state, their value might be enhanced if more deer forage could be produced by removing, or at least thinning, the old growth timber. Deer use should be monitored before and after cutting, vegetative biomass measurements taken, and a program set up for slash disposal and periodic removal of conifer regeneration or to continue more patch cutting as necessary. This project seems especially appropriate for the suggested area and conditions. Not only has much of the preferred browse been killed, but deer can probably make better winter use of clearcuts there than in higher snowfall areas to the east and north. Such patch cuts would not be effective as foraging areas during periods of heavy snowfall.

In the Sitka area, summer ranges continue to produce more deer than the winter ranges can support, and thus far hunting has not been sufficiently effective in reducing deer numbers to provide adequate relief for winter range improvement. To some extent the expected reduction in carrying capacity of some of the summer range as a result of clearcutting may relieve this pressure on the winter range. At present, however, Forest Service personnel consider that more winter than summer range has been clearcut. It would certainly be better to harvest surplus deer by hunting, but if that does not work, it is still important to preserve the quality of winter range by other means.

Large-scale commercial thinnings are still many years away in southeast Alaska because there are few areas with young stands. There are enough young stands, however that research on commercial thinning should begin. When thinnings are made, deer use, forage production, and snow interception should be studied.

Studies are now underway by the Alaska Department of Fish and Game and the Forest Service to elucidate these points.

More research is needed on forage preferences and diets of deer especially during the critical winter period. Preferences can be studied from field observations by comparing forage species availability with utilization. A more meaningful approach is the "cafeteria" system where the samples of forage plants are offered to well-fed captive deer (Longhurst et al. 1979). From information so derived a manager can appraise range quality by noting the relative abundance of preferred and poor forage.

Analysis of rumen and fecal samples can help quantify deer diets from a variety of habitats. The value of such data is greatly enhanced if compared with availability of forage species. Dr. Carroll Perkins, a wildlife professor at the University of Southern Mississippi and his wife spent the past two summers on Prince of Wales Island on botanical and wildlife observations, and has expressed a willingness to undertake such a study. From our discussions with him, we are convinced that if other means of gathering this kind of information are not available, he could make a contribution towards a better understanding of deer diets, especially during summer. He and his wife have botanical backgrounds, and have gathered a good plant reference collection from the island. Their university also has a person trained in microtechniques for plant identification from fecal samples.

Our previous experience using and modifying the methods developed by Hanson at Ft. Collins for microidentification have given us considerable insight into their drawbacks, but microidentification is a virtual necessity for determination of many of the forb and grass species consumed by deer when rumen or fecal samples are analyzed.

If possible, in vitro digestive studies should also be carried out to determine the nutritional adequacy of various diets available to deer. These studies provide information which cannot be obtained from proximate chemical analyses. Longhurst et al. (1979), for example, found a much closer correlation between deer preferences of a variety of forage species and digestibility than between preference and protein content.

As a result of extensive personal experience with in vitro digestion studies, a few suggestions may be in order here. A source of standardized rumen fluid is necessary for precise comparison of digestibility of various forage species. Fistulated sheep or goats maintained on standardized diets can provide the rumen inoculum and results can be compared with deer if cross checks are made with deer rumen fluid. Fistulated deer would be better, but they are often difficult to maintain.

It is feasible to collect fresh forage samples in the field and transport them to the laboratory in plastic bags for analysis. If storage is necessary for more than a few days, samples can be frozen. Dried samples should be avoided because many volatile plant metabolites which can affect rumen microbes and thereby alter digestibility may be lost in the drying process. Corrections for water content of fresh or frozen samples can be made by weighing and drying an aliquot.

Fresh or frozen green vegetation can be easily ground with a mortar and pestle for in vitro digestion analysis if the sample is first frozen with dry ice or liquid nitrogen. Once digestibilities of individual species are determined at various growth stages, mixtures should be tested to explore synergistic relationships. The augmented digestibility of forage when arboreal lichens such as Alectoria were added to the diet as reported by Rochelle (1980) is a good case in point.

Unless a better data base on species-related forage quality is obtained, forest managers have few guidelines available to assist them in developing procedures to favor the most valuable food plants. Admittedly this level of sophistication in research and forest management is not likely to be developed in the immediate future. We

are convinced that to merely determine what deer eat under various sets of field conditions is but a first step, along the road to understanding nutritional relationships. Given a free choice, deer's selection of food items may differ significantly from what they are forced to take in the wild.

Herd Dynamics

Herd dynamics is of lower priority for research than deer/forest relationships, but we nonetheless believe it is important especially at such time that hunting exerts a controlling influence even on localized deer populations.

Some early workers such as Klein obtained data on sex and age classes of hunter-killed deer and deer lost during winter in addition to herd composition counts during late summer, early fall, and during winter. At present, Alaska Department of Fish and Game personnel do not believe they can manage deer intensively and, therefore, little effort is currently being made to collect this type of data. We feel it is important, however, and efforts should be made to ensure its collection. This type of data gathering would not come under research and it would therefore seem appropriate that Forest Service administrative biologists could aid the Alaska Department of Fish and Game in its collection. In addition to a stepped-up effort to obtain sex and age records for hunter kills, hunters should be asked to save reproductive tracts from does. Ovarian sections provide information on the reproductive rate of does by age and a description of udder condition provides information on neo-natal mortality. For example, an undeveloped and unpigmented udder and teats indicate that the does have not been bred or had suffered a prenatal loss. An udder with development and pigmentation shows that a fawn or fawns was/were successfully reared, whereas, udders with some pigmentation and enlarged teats but no development of parenchymous tissue probably indicates a neonatal loss.

Klein's observations and those of other biologists in southeast Alaska indicate the difficulty of deriving representative doe-fawn ratios during summer and early fall even in units with alpine conditions. Does in the subalpine and alpine areas where they are readily visible generally have fewer fawns than in the lower timbered areas. It is possible that "dry" does--as well as bucks--tend to collect at higher elevations. Any herd classifications that are made in the same habitats, however, may prove useful for year-to-year comparisons. The ratio of twins to single fawns is also a measure of reproductive success. Owing to the reportedly rather high proportion of button antlers among yearling bucks in some areas it may be inadvisable to make sex ratio counts. The proportion of fawns in herd counts in late summer and during winter gives useful information, however. In California where both resident and migratory deer are found, resident does normally have a lower ovulation rate than does which migrate to higher elevations and fresh food supplies in summer. It might be useful to check on this in Alaska.

Since the many variables affecting deer welfare vary from island to island and between islands and the mainland, we suggest that each of the four game management units of the Alaska Department of Fish and Game be divided further into subunits. All data on herd dynamics, hunter kills, and habitat would be more useful if maintained in the appropriate subunit files. Weaknesses have been noted by some of the biologists (Johnson and Wood 1979) in estimates of the annual deer kill. Because this information is so very important in management of the species we recommend that an effort be made to improve this data base.

Predator Relationships

Merriam (1965b) with his release of wolves on Coronation Island has conducted the only deer predator study in southeast Alaska of which we are aware. The wolves and a badly over-used range combined to drastically reduce deer numbers. With the deer decline and scarcity of buffer foods the wolves themselves died out. To what extent island size and range

conditions may have influenced results was not fully appraised. Wolves survived on several nearby but larger islands despite very low deer numbers after two especially severe winters--1968-1969 and 1971-1972. Some biologists consider that predation magnified the effect of these severe winters and that deer were reduced to such a low point that recovery has been exceptionally slow on these islands. Numbers are still considered too low by the Alaska Department of Fish and Game to permit sport hunting.

Predator Studies

Research to assess the influence of black and brown bears, and wolves on deer should have high priority. The Alaska Department of Fish and Game and the Forest Service are planning a study to assess the effects of timber cutting on brown bears; this study should also provide information on predation. A black bear telemetry study has been initiated by the Forest Service on Mitkof Island under the supervision of Dr. Erickson of the University of Washington for the primary purpose of determining denning preferences as related to logging practices. The study should be expanded to include the relative use of logged versus unlogged areas, food habits, and the role of the black bear as a predator of deer. Reliance of black bears on berries emphasizes the need for a study of berry production in various forest habitats.

Southeast Alaska appears to offer an unparalleled opportunity to study deer-predator relationships. Some islands have brown bears but no wolves or black bears; others have black bears and wolves, and a few of the smaller islands have no predators. The deer-predator question would provide ideal long-term study problems for a university to undertake. A series of graduate students under the direction of a faculty member could provide the continuity such a study would require. We have in mind an arrangement such as the wolf-moose studies on Isle Royale directed by Dr. Durward Allen.

Consumptive and Nonconsumptive Uses

The principle need for research on various uses in this field is a sounder biological base for setting seasons and bag limits for deer hunting. Presently too much reliance is placed on local game advisory groups for making these important game management decisions. In some of the game reports we have read, even the manager has expressed concern that the kill may have been excessive when numbers of deer were forced to the beach by early snow. This concern over excessive kill was expressed despite overuse of winter range browse extending over the past two to three decades. Accumulation of reported data on hunting removals, herd dynamics, populations and range condition is essential. Until better hunting control of the deer herds is forthcoming, it seems futile to attempt enhancement of deer habitat in second-growth stands. Further, this lack of control weakens the argument for retention of large acreages of old growth timber where hunting is negligible and is likely to remain so for the forseeable future. However, knowledgeable biologists with the Alaska Department of Fish and Game who have observed the impacts of severe winters consider that excessive cutting of critical winter range may eliminate deer from the areas affected.

The perceptive observations of Klein (1957b) over 20 years ago in regard to deer management are as valid today as they were then. He felt that the greatest problems were (1) maintaining the carrying capacity of the deer range, and (2) achieving maximum utilization of the herds to provide the greatest returns for recreation and herd productivity.

Whether full utilization of deer herds in southeast Alaska will ever be fully achieved through sport and subsistence hunting is, of course, debatable. Although deer tag returns provide some information on the magnitude and distribution of the sport hunting kill, better data on hunting effort and success by area would aid in establishing priority areas for wildlife habitat maintainance and enhancement efforts. For example, it might be interesting to

determine what proportion of hunters take the full limit of four deer in areas where this is allowed. If only a small percentage of hunters takes the full limit it would make an insignificant difference in the total kill if the limit were removed entirely.

We recognize the aesthetic value of deer to the sightseer, hiker, or photographer but we can suggest no high priority research needs on nonconsumptive uses of deer.

Goats

Two studies are currently underway at the Forestry Sciences Laboratory to investigate the dependence of goats on old growth timber habitat. We were told that on the Cleveland Peninsula goats spend relatively more time in timber types than elsewhere.

Furbearers

Concern has been expressed by many that clearcutting, much of which has been carried out in the past along beachfront and streamside areas, will adversely affect marten, otter, and mink. All species are dependent to some degree on tree cover but the degree of reliance on old growth is not clear. Beach fringe and streamside tree cover would be especially important for mink and otter, whereas marten require extensive areas of coniferous forest. Koelher et al. (1975), reported that marten preferred a diversity of timbered communities occupying mesic sites while Martin (1957) found mature coniferous timber to be preferred. To what extent small clearcuts of 100 acres or less impact marten is only speculative. Koelher et al. (1975), did not observe marten crossing clearings exceeding 300 feet so that the larger clearcuts would seemingly affect marten adversely. On the other hand, several observers have reported voles to be the main food for marten (Lensink et al. 1955, Quick 1955, Murie 1961, Weckwerth and Hawley, 1962). Harris (1968) found that voles increased during the first years following clearcutting on Prince of Wales Island.

Marten are generally associated with climax forests so that one might expect marten reductions to be commensurate with the percentage of timber cut. This belief has arisen perhaps because most of the studies have been made during winter when there was a tracking snow. These studies have revealed the reluctance of marten to venture into openings (Koehler and Hornocker 1977, Hawley and Newby 1957, and Robinson 1953). Koehler and Hornocker (1977), however, go on to say that "open meadows and burns, avoided by marten in winter, may be used in the summer and fall seasons if they provide adequate cover and food. The high occurrence of fruit, insects and ground squirrels in the summer-fall diet offers evidence marten used open areas". Their own observations, in addition to those of Dice (1921), Grinnel et al. (1937), Hagmeir (1956) and Streeter and Braun (1968) lead the authors to conclude that marten do not require the cover of dense timber during summer. Streeter and Braun (1968) reported on summer sightings of marten some distance from timber--the furthest being 2-miles. Most of the sightings were in boulder fields above timberline where rocks provided cover and pikas and rodents provided an abundant food supply.

Certainly logging debris and plant cover in cutovers of southeast Alaska offer as much or more cover than alpine boulder fields. These cutovers also supply a number of the marten's preferred foods (small mammals), at least during the first two decades after cutting. Harris (1968), for example, found during a 9-year study on Prince of Wales Island that Peromyscus was six times more abundant in climax timber than on an adjacent clearcut while the reverse was true for Microtus. Shrews were twice as abundant in the clearcuts. A number of food habit studies have shown that Peromyscus and shrews are unimportant marten foods but Microtus is at or near the top. In Montana, Weckworth and Hawley (1962) determined from 1758 scats, collected for all seasons, that Microtus was found in 37.0% compared to the next most common, Clethrionomys, with 29.7%. This relationship was interesting and puzzling since snap trapping indicated that Clethrionomys was much more abundant

than Microtus. Either Microtus was preferred by marten or was more easily taken by them, or snap trapping did not reveal the true ratio of the species. Lensink et al. (1955) reported 72% combined for the two genera in interior Alaska but where remains were separable Microtus occurred in 11% of the samples compared to 3% for Clethrionomys. In still another study Koehler and Hornocker (1977) reported reverse percentages for north central Idaho--30% for Microtus and 36% for Clethrionomys. Clethrionomys is a mouse of climax forests and while Taylor (in press) records it as common in southeast Alaska, it apparently was not present on Prince of Wales Island where Harris made his study. Gashwiler (1970) found that Clethrionomys populations declined following logging but that Microtus increased in west central Oregon. Mesic sites with an abundance of herbaceous plants are preferred by Microtus and improved habitat is commonly produced for them following logging. Goertz (1964) noted that the preferred habitat for Microtus in western Oregon was grassy clearcuts. Our observations indicate that Microtus responds similarly to clearcutting in Alaska but that populations may reach high densities in some years and localities. At several places we noted damaged patches on the bark of alder up to 4 or 5 feet above the ground. This type of damage is identical to that found on the trunks of aspen in the central Rocky Mountains. Dr. Donald Spencer has identified the damage to aspen bark to be caused by Microtus during the winter when population highs and snow depths combine to create food shortages (personal communication).

Fruits and insects are important summer foods of marten. Weckworth and Hawley (1962) reported that fruits formed 24-52% of the food occurrences in marten scats in summer and fall. Vaccinium was the most prevalent. Insects were also found in 22-52% of the scats in summer, varying by year. Koehler and Hornocker (1977) considered these foods to be more available in open areas. In summary, we do not feel there is strong evidence that timber cutting, especially on 100-acre or smaller tracts as now practiced by the Forest Service in the Tongass National Forest, will seriously affect marten. Dispersed cuttings may even improve the marten's food base. However, D.E. McKnight of Alaska Department of Fish and Game considers that microtines are apt to be replaced by Peromyscus in cutover areas which would reduce the food supply for marten.

Studies are to be initiated shortly on the effects of logging on marten, mink, and otter by the Alaska Department of Fish and Game in cooperation with the University of Alaska, the Forest Service, and the Alaska Lumber and Pulp Company. These studies should fill many of the gaps in information about these valuable furbearers.

Birds

The influence of clearcutting on bird life in the Tongass National Forest has been investigated, but we suspect that more work will be necessary to adequately quantify impacts. The USDI Fish and Wildlife Service is monitoring the influence of cutting to within 330 feet of trees with eagle nests. In our view, the Forest Service has leaned over backward to alleviate adverse impacts on eagles by prohibiting cutting within 330 feet of nest trees and by leaving strips of uncut timber along shores frequented by eagles. Technical personnel of the Audubon Society with whom we have talked are more concerned about the probable impact of timber cutting along the Chilkat River on eagles than with anything being done in the Tongass. Cutting in the Chilkat River area has been authorized by none other than the State of Alaska, and while actual cutting has not yet started owing to a depressed timber market, the threat nonetheless remains.

Even the areas selected for cutting will not become biological deserts. Some of the early successional stages produce more wildlife foods, particularly berries, than climax forest. We saw a flock of more than 100 ravens on Sokolof Island feeding avidly on elderberries. A variety of other birds also use the berry crop. Successional stages create niches for some species of birds that are scarce

or lacking in climax timber. On Kosciusko Island, Kessler (1979) found that several species of birds preferred successional stages to climax timber. These species included the winter wren, junco, orange-crowned kinglet, and robin. Some of the raptors prefer early-stage clearcuts for hunting. Noble (in progress) found on Prince of Wales Island that a 23-year clearcut supported a higher population of breeding birds and a greater number of species than did the adjacent climax timber. The public is becoming increasingly appreciative of non-game wildlife, and this segment of wildlife should not be ignored in the timber versus wildlife controversy.

Through a faculty exchange program, the Forest Service also has several studies underway on bird response to clearcutting, use of snags, and populations in various forest habitats (Kessler 1979, Gibson 1976, Noble 1978, in progress). The work of Sundstrom should also direct attention to deficiencies in the present data bases.

OTHER TOPICS CONSIDERED

During discussions about our report at the Forest Service Regional Office in Juneau, several other topics emerged which should be discussed here.

Emphasis on Wildlife in Forest Management

In the Forest Service planning process, thought should be given to the relative merit of focusing on featured wildlife species (big game and possibly furbearers) versus the whole spectrum of game and non-game species. Likewise, it would be appropriate to investigate the magnitude of use and public interest in various wildlife species.

Experimental Logging Systems

We perceive the need to explore methods of harvesting timber and handling slash to meet specialized wildlife needs. Some of these include: (1) selective logging along the beach and elsewhere--A frame, balloon, helicopter, etc.; (2) FMC machine--winter logging; and (3) slash removal with grapples, broadcast burning, piling, and burning.

Responsibilities of the Forest Service and Alaska Department of Fish and Game

A better definition and understanding is needed for responsibilities for both management and research. The present situation in which the Forest Service is responsible for the habitat and the Alaska Department of Fish and Game manages the wildlife may be expedient but in our estimation is not entirely workable.

Earlier in this report we have mentioned the need for close liaison between the Forest Service and Alaska Department of Fish and Game. This seems to be working best in research, but we believe there is room for improvement in gathering inventory data needed for year-to-year management decisions on both wildlife populations and habitat. When wildlife habitat is to be protected or enhanced at

the expense of timber production or utilization, close interagency cooperation is needed to understand and resolve field problems. There are some differences in the constituencies of the two agencies, but also a remarkable degree of overlap. If sufficient effort is put into cooperative resolution of problems, better future management of forest and wildlife resources should result. Wildlife species and their habitats are so inextricably intertwined that artificial administrative barriers separating management are not realistic.

Outdoor Laboratory

The Forest Service and Alaska Department of Fish and Game have a unique opportunity to utilize individual islands or parts of islands for comparative study areas. This concept should have application for both research and management trials covering the whole spectrum of forest, wildlife, and multiple use.

MANPOWER NEEDS

The following list enumerates the wildlife biologist positions on the three administrative districts of the Tongass National Forest in Fiscal Year 1981 and prior to reorganization into ranger districts and indicates the proportion of their time devoted to timber sales and other duties.

Ketchikan - Glen Contreras and Paul Harrington
1) 3 permanemet full-time wildlife biologist positions (1 of those vacant)
2) 60-70% work with timber sales
3) 10% habitat improvements; habitat management tied in with timber
4) 2 administrative studies ongoing

Stikine - Dick Irrizarry and Jeff Hughes
1) 4 permanant full-time wildlife biologists
2) 70% work with timber sales
3) 10-15% habitat improvement; habitat management related to timber
4) 1 administrative study - Thomas Bay moose
2 studies under contract - black bear denning/muskrat

Chatham - Norm Howse, Mike Perensovich, and Virgil Henke
1) 3 permanent full-time wildlife biologists, 1 botanist, 1 cooperative education student
2) 40-50% full time with timber sales
3) 10% with habitat improvement
4) 1 administrative study

Discussion

Most of the present staff time is devoted to timber sales. We agree this is necessary but there is also a need to acquire additional data as previously discussed. If the present distribution of effort is continued there is little likelihood that research needs plus the acquisition of annual inventory information will be fulfilled. We suggest that either more biologists be recruited or that other means of satisfying research requirements be explored.

Some contracts with universities are presently in progress and more could be considered. Additional administrative studies are another possibility. There are indications that the Alaska Department of Fish and Game is prepared to undertake more research on pertinent problems if the Forest Service could provide funding. The Forestry Sciences Laboratory should also expand its research efforts in this area. We are not in a position to judge the relative merits or cost effectiveness of the various options, but we do feel that unless a better data base for management decisions becomes available, Forest Service credibility will continue to suffer.

With the limited number of wildlife biologists available in southeast Alaska, all the necessary wildlife investigations cannot be initiated or carried forward as rapidly as desired. For example, as pointed out by Alaska Department of Fish and Game, brown and black bear studies are urgently needed as is investigation of furbearers and a number of bird species. Now that a good start has been made on deer research, however, we think these studies should be continued and even augmented until enough information is obtained for management purposes.

PLANNING

In order to facilitate planning and decision making on the Tongass National Forest a better comprehensive system of wildlife information retrieval and analysis is necessary. Several disparate systems are now being used: 1) A storage and retrieval system for wildlife habitat relationships by Jack Marshall and Paul Harrington, Ketchikan; 2) An attempt to combine the Timber RAM program with information on deer habitat use by Wallmo and Schoen at Juneau; 3) The timber RAM program is utilized primarily for timber management planning; 4) FORPLAN, the program in general use throughout the national forest system is at present only being used on the Chugach National Forest in this region; and 5) A project by Charles Sundstrom at Juneau to define wildlife habitat relationships using the techniques developed by Thomas et al. (1979) for the Blue Mountains of Oregon and Washington.

Individually, these systems are designed to help satisfy different kinds of information needs. We are not aware that their capabilities are collectively being directed toward the whole spectrum of multiple-use planning.

Wallmo's retirement in 1980 left a significant gap in the deer investigation program at the Forestry Sciences Laboratory. He has been replaced by Thomas Hanley, who has prepared a detailed problem analysis of big game-forest management relationships (Hanley 1981). We agree with his priorities for continued deer and habitat research, namely: 1) old growth community analysis; 2) secondary succession analysis; 3) food habits and digestion studies; 4) food quality (energy) investigation; 5) winter as most-limiting-factor study; 6) foraging cost function study; 7) energy intake function study; 8) herb-layer, evergreen forages and lichen litter study; 9) forest canopy - snow relationships; 10) understory response to thinning; 11) habitat selection; 12) deer impact on vegetation; and 13) predicted carrying capacity investigation.

BUDGETS

Sikes Act

The opportunity for close liaison between State and Federal agencies instigated under Public Law 93-452, which was passed in 1974, had considerable potential for promoting joint wildlife projects in the Tongass National Forest. It is our understanding, however, that Federal funding has not been requested. This is unfortunate because the need is as great now as in 1974 for close cooperation between the Forest Service and Alaska State agencies. Some of the coverage specified in the Sikes Act Comprehensive Plans is now being carried out under regular appropriation funds, however.

KV Funds

KV funds have not been extensively used to enhance wildlife habitat in the Alaska Region. The following projects and cost estimates have been proposed by the Region:

Thinning	200 acres @ $275	$55,000
Seeding	5 acres @ $500	2,500
Construction of Nesting Island	2500 feet @ $5.36	13,400
Habitat Study	72 acres @ $415.28	29,900
Habitat Enhancement	75 acres @ $200	15,000
Habitat Improvement	3750 acres @ $250	937,500

One of these projects involves thinning to enhance wildlife habitat. We note that one of the policy restrictions is that KV funds be utilized within 10-years, but much of the value of thinnings come in the 12-20 year period. Also, it may be worthwhile to retain some small clearcuts in forage status and keep them free of conifer regrowth; this would require attention over the life of the timber rotation. If there is any chance that the 10-year restriction on the use of KV funds can be lifted in favor of a longer period it should be done.

Another project proposed is wildlife habitat improvement. Presumably this could include planting of browse species on depleted winter deer ranges. We do not recommend such a program unless the deer herd has undergone a substantial reduction, i.e., following a severe winter or if hunting ever becomes effective enough to exert herd control. If, after further study, slash is determined to be a major factor retarding the summer use of clearcuts by deer, attention should be given to this program as a means of wildlife ennancement.

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APPENDIX I

Persons Contacted

Ketchikan

USDA Forest Service

James Watson, Forest Superivsor
Glen Contreras, Program Manager, Fisheries and Wildlife
Paul Harrington, Wildlife Biologist
Michael Novy, Interdisciplinary Forester, Fisheries and Wildlife
Charles Gass, Program Manager, Planning
Kathy Lucich, Wildlife Biologist

Alaska Department of Fish and Game

Robert Wood, Game Biologist

Louisiana-Pacific, Ketchikan

Donald Finney, Forestry and Government Affairs Manager
George Woodbury, Logging Engineer

Others

Dr. and Mrs. Carroll Perkins, University of Southern Mississippi
President, Ketchikan Conservation Society (SEACC)

Petersburg

USDA Forest Service

John Butruille, Forest Supervisor
James Kimbal, Program Manager, Fisheries and Wildlife
Richard Irizarry, Fisheries Biologist
Joe Doerr, Wildlife Biologist
Jeff Hughes, Wildlife Biologist
Spen Israelson, Forestry Technician
David Cottrell, Timber Planner
William Overdorff, Program Manager, Planning
Richard Estelle, Planning Systems Specialist
James Brighenti, Seasonal Aid
Marie Morin, Seasonal Aid

Alaska Department of Fish and Game

H.B. Merriam, Game Biologist (contacted in February)
E.L. Young, Game Biologist (contacted in July)

Others

Dr. Thomas Wood, President Petersburg Conservation Society (SEACC)

Sitka

USDA Forest Service

William Gee, Forest Supervisor
Norman Howse, Program Manager, Fisheries and Wildlife
Michael Perensovich, Assistant Program Manager
Virgil Henke, Wildlife Biologist
Mary Muller, Botanist
John Standerwick, Timber Program Manager
Evans Lutz, Forester-Long Term

Alaska Department of Fish and Game

Loyal Johnson, Game Biologist

Alaska Lumber and Pulp

Peter Huberth, Resource Coordinator
Vernon Eliason, Chief Logging Engineer
Leo Evans, Logging Engineer
Ralph Fenner
Don Soukup

Others

Richard F. Billings (former Soil Scientist, USDA Forest Service)
Tarlton Smith (formerly Biologist, US Fish and Wildlife Service; presently a Master Guide

Juneau

USDA Forest Service (Administration)

John A. Sandor, Regional Forester
Sigurd Olsen, Director of Wildlife and Fisheries (February)
Bill Sheridan, Regional Fisheries Biologist
Dave Dunaway, Wildlife Biologist
John Raynor, Leader, Timber Sales Group

Duane Packer, Leader, Inventory, Plans and Silviculture
Charles Sundstrom, Regional Wildlife Habitat Relationships Coordinator
Al Aitken, Timber Sale Specialist
Jim Pierce, FORPLAN, R-10 Planning, Programing, and Budgeting Management
Susan Boyle, Management Analyst, Management Systems, R-10
Ron Dippold, Special Assistant to Director of Timber

USDA Forest Service (Forestry Sciences Laboratory

Don Schmiege, Program Leader
Wilbur Farr, Mensurationist
A.S. Haris, Silviculturist
O.C. Wallmo, Wildlife Biologist

The Alaska Department of Fish and Game

Ronald Skoog, Director (February)
Donald McKnight, Game Research Chief
Jack Lentfer, Game Supervisor
Nate Johnson, Wildlife Biologist
John Schoen, Wildlife Biologist

APPENDIX II

Areas Visited During Assignment

Ketchikan - Met with Louisiana-Pacific, officials at their pulp plant.

Traveled by boat with Alaska Department of Fish and Game biologist to Gravina Island and hiked through portion of winter deer range.

Flew to Craig and drove by car to clearcuts east and south of Craig on Prince of Wales Island on upper Harris River and Trocadero Bay drainage.

Flew to Hollis on Prince of Wales Island and drove to clearcuts and thinning sites near Harris River.

Petersburg - Drove to different age clearcuts and to old growth stand along Loop Road, Mitkof Island.

Flew to Sokolof Island for on-the-ground examination of deer sign in old growth and clearcuts; flew over Level Island for a view of deer habitat; flew over Stikine River Delta for view of moose habitat.

Flew to Thomas Bay and drove to moose and deer habitats in old growth timber and in clearcuts.

Sitka - Flew to lake above Fish Bay for hike into subalpine and alpine habitats.

Taken by State game biologist to overbrowsed winter deer ranges, deer exclosures, and to clearcut thinning sites on or near Halleck and Krugof Islands. With State game biologist, posted a deer for parasites, condition factors, and food habits data.

Met with Alaska Lumber and Pulp officials at their plant and visisted Green Lake Reservoir site to see logging equipment in operation. This was an example of maximum slash removal.

Juneau - Visited a climax timber site and two second-growth stands in February for view of relative snow and forage conditions.

APPENDIX III

Review of Comments Received on Draft Report of August 15, 1980

We received written comments from the following persons:

USDA Forest Service

Dale A. Jones - Washington, D.C.
J.S. Watson - Ketchikan
W. Dale Heigh - Juneau
Donald C. Schmiege - Juneau
John F. Thilenius - Cordova
Mike Perensovich - Sitka
Norman R. Howse - Sitka
Thomas P. Lennon - Juneau
Thomas A. Hanley - Juneau
Hank Hays - Anchorage
O.C. Wallmo - Bozeman, MT (Retired)
Jim Kimbal - Petersburg
Marie Morin - Petersburg
Ken H. Wright - Portland
Dick Irizarry - Petersburg
Joe Doerr - Petersburg

Alaska Department of Fish and Game

Jack W. Lentfer - Juneau
John W. Schoen - Juneau
Donald E. McKnight - Juneau
E.L. Young - Petersburg
Loyal Johnson - Sitka

Private Individuals

Curtis G. Shattuck - Juneau

Note: These written comments will be held on file at the Regional Forester's office in Juneau for reference purposes.

Summary of Comments

The comments received were most helpful for the preparation of our final report and drew our attention to many details which we had either overlooked or had failed to interpret adequately. We have modified the final report to

take advantage of the commments offered. For the most part, the comments were constructive and useful. We did detect a certain amount of resentment, however, in some of the communications that another team of "outsiders" had been called in to review the wildlife-timber management controversy in hope of producing support for timber harvest. Some felt that it was likely that additional review teams would be brought in until the "foresters" got the answers they wanted.

A consistent theme, especially for the Alaska Department of Fish and Game personnel was that we failed to appreciate the potential for adverse effects of clearcutting on wildlife, particulartly deer. Frequently this was blamed on our inexperience in Alaska, and unfamiliarity with local conditions. Some also pointed out that we had not reviewed and cited a number of pertinent references in the literature and that we were not aware of the widespread dependence of wildlife on old growth forests. Some thought we were biased in favor of timber exploitation.

Others considered that we had placed undue emphasis on deer and had not given sufficient attention to other wildlife, while some thought we should have confined our remarks to the deer problem exclusively. A number objected to our suggestion of introducing Roosevelt elk and thought that serious competition with deer might result. Likewise some thought that elk would only serve to complicate management problems when they were still not able to manage deer.

A number considered that we were overly concerned with only raising wildlife for sport hunting and were ignoring subsistence hunting and non-consumptive uses. Several Alaska Department of Fish and Game people thought their seasons were sufficiently generous and did not agree with our statements regarding their being overly conservative with respect to wildlife harvests.

Our statements on the benefits of increasing ungulate diversity through elk introduction were also not accepted by some who pointed to examples of exotic introductions which have caused problems of range deterioration. Australia and New Zealand are areas which have had problems of this kind. One person questioned the figure which we quoted in our section on budget relationships concerning the expenditure of $937,500 on wildlife habitat improvement and wondered where the funds were used.

Our discussion of the windthrow problem and stabilization of forest edges also did not find favor with a number of commentators. This was true as well with the example we cited of the Bradfield Canal area as a site which had been extensivley clearcut.

Space does not permit us to cover all comments in detail, but these examples illustrate some of the objections which were raised. In contrast, a number of people thought our review was reasonably comprehensive and objective. We did not expect that our findings would receive broad agreement, and with such a diverse body of information and such controversial opinions to deal with, we are gratified that our draft report found as much acceptance as it did.

Needless to say, we did attempt an objective problem analysis and are personally responsible for the conclusions reached. Our judgment is that we suspect no final solution to the controversial aspects of timber harvesting will be reached short of virtual complete cessation of clearcutting.

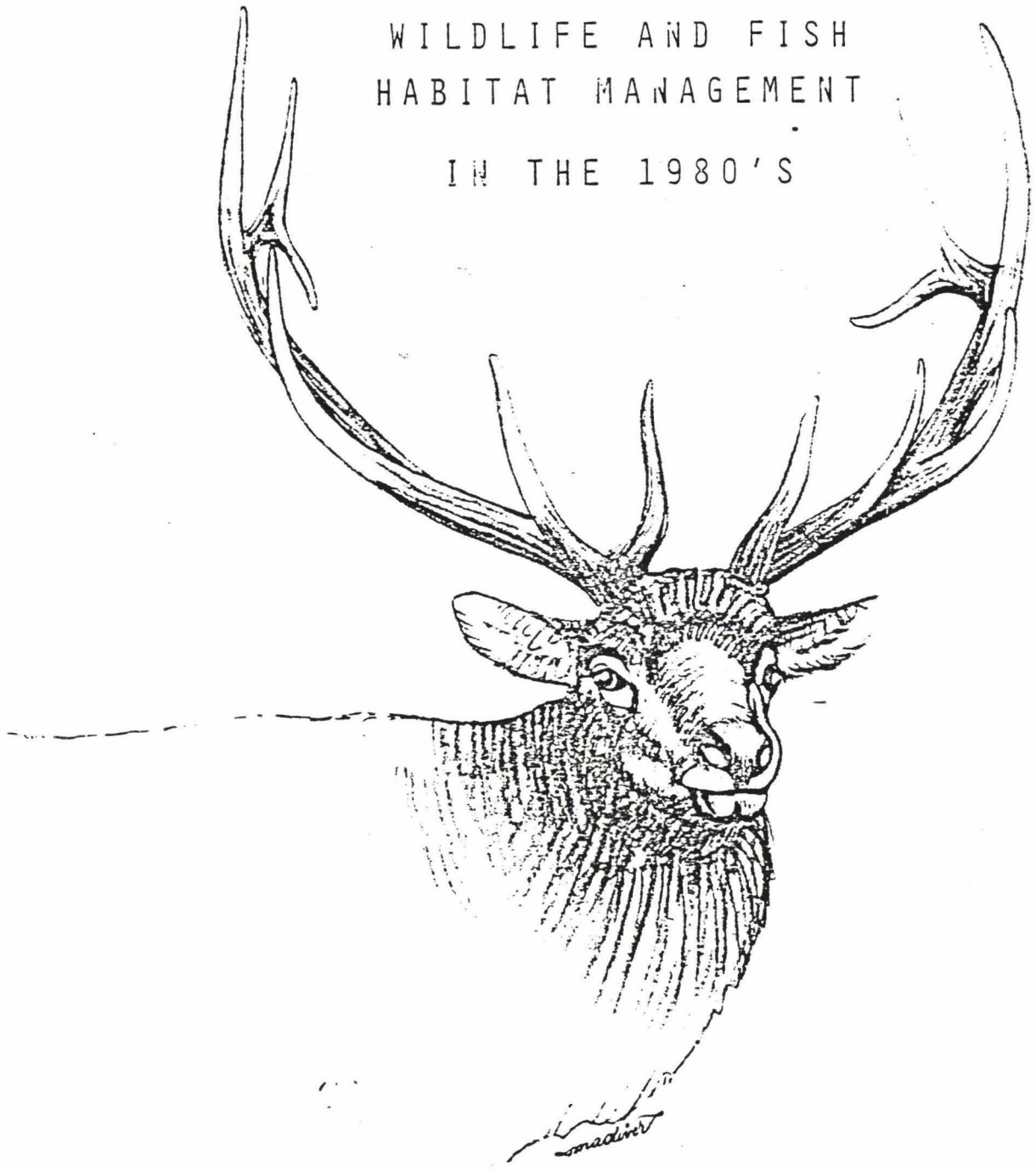
APPENDIX IV

FOREST SERVICE

POLICY, GOALS, AND OBJECTIVES

FOR

WILDLIFE AND FISH HABITAT MANAGEMENT IN THE 1980'S



JUNE, 1980

FOREWORD

We in the Forest Service have needed for some time to firm up direction for the management of wildlife and fish habitat. The policies, goals and objectives herein provide that direction. The goals have been established as part of the 1980 RPA Program developed under the Renewable Resource Planning Act of 1974 as amended by the National Forest Management Act of 1976.

The nearly 188 million acres of National Forest System lands provide habitat for a variety of wildlife and fish species associated with the forest and range lands of the United States. These lands provide the public with enjoyment of the fish and wildlife resources, and are important to the economy of the Nation. Planned management of these forest lands and associated waters offers opportunities to improve their capability to yield fish and wildlife benefits. These lands also provide important habitat for a number of species considered endangered or in need of special protection to insure their survival.

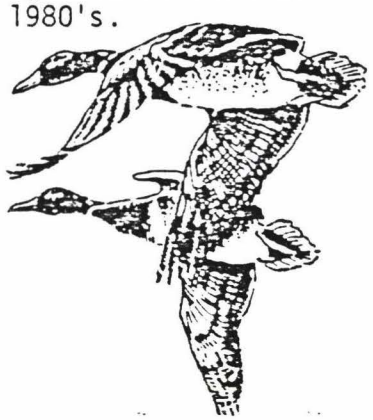
Forest Service programs provide opportunities to encourage management of wildlife and fish habitat in cooperation with State and private landowners. Since the majority of the habitat in the Nation is located on private lands, it is important that wildlife and fish needs be recognized in the management of these lands. Many wildlife and fish species inhabit both public and private lands and waters during their life cycles. Because of this mobility, coordination in planning and programing among Federal, State, and local agencies is particularly important.

The way in which we manage our national resources is an important facet to the quality of environment we can expect and the economic opportunities the public will have in the future. Wildlife and fish are barometers of the environment we will leave to future generations. Therefore, it is important that we understand the relationships among wildlife, man, and his environment.

The interrelationship among plants and animals and man in the forests and rangelands requires that an ecosystem approach be applied in the management of wildlife and fish habitat. It is important that we give consideration to all species of plants and animals if we are to achieve our wildlife and fish goals, along with other multiple use benefits. Our research effort must better define the relationships between wildlife and fish and their habitats, and provide guidelines for the management of forest and range lands to meet social needs.

These policies, goals, and objectives provide a framework for guiding Forest Service wildlife and fish programs in the management of forests and rangelands of the United States as we enter the 1980's.

R. MAX PETERSON
Chief



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NATIONAL POLICIES

A. Give coequal consideration to wildlife and fish habitat with other resources in Forest Service programs.

B. Recognize the State wildlife and fish agencies as responsible for the management of animals and the Forest Service as responsible for the management of habitat.

C. Establish goals and objectives for wildlife and fish management. Incorporate habitat requirements consistent with these goals and objectives in all appropriate Forest Service plans, programs, and activities. Establish monitoring programs to insure on-the-ground compliance.

D. Include professional wildlife and fish expertise in interdisciplinary teams that address issues affecting wildlife or fish.

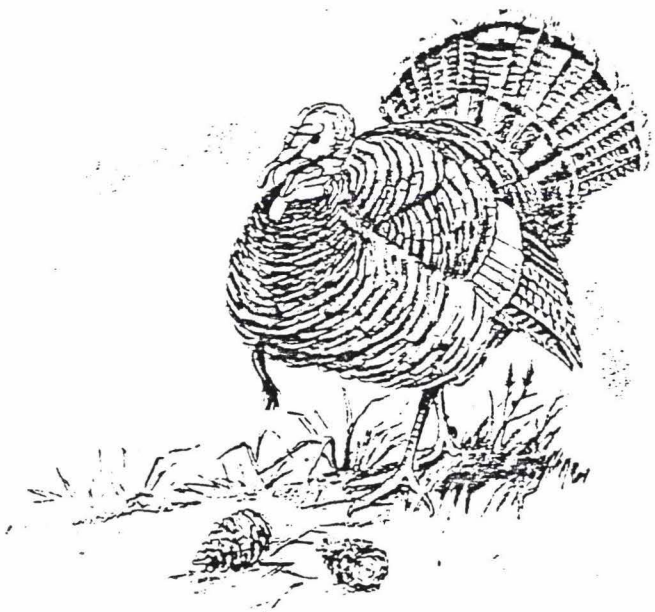
E. Provide wildlife and fish information on an ecosystem basis so that interactions among species can be determined for management activities.

F. Manage habitats that will, as a minimum, maintain self-perpetuating populations of existing species indigenous to specified land management units.

G. Improve coordination of Forest Service programs, plans, and activities which affect wildlife and fish or their habitats with appropriate local, State, and Federal agencies and interest groups.

H. Protect and improve the status of threatened and endangered plant and animal species.

I. Recognize Native American's legally established subsistance use of wildlife and fish on National Forest System lands.



NATIONAL GOALS

Through Forest Service programs and activities:

1. Provide the habitats for populations, species mixes, and distributions of wildlife and fish needed to:

   (a) provide opportunities for appropriate public use and enjoyment,

   (b) achieve ecosystem management objectives and

   (c) assure that species requiring special habitats do not become threatened or endangered because of man's activities.

2. Improve the status of threatened and endangered species to a point where they no longer need the protection of listing in the FEDERAL REGISTER under the Endangered Species Act.

NATIONAL OBJECTIVES

GOAL 1a - PROVIDE OPPORTUNITIES FOR APPROPRIATE PUBLIC USE AND ENJOYMENT

Explanation

Providing public use and enjoyment of wildlife and fish is a major resource activity. Forest Service programs must capitalize on opportunities to enhance wildlife and fish if projected demands are to be met. The program will be aimed at satisfying all users of the wildlife and fish resource.

Objectives

1. Identify, in land and resource management planning, opportunities and demands for appropriate uses of wildlife and fish resources. (RF--Dec 1983)

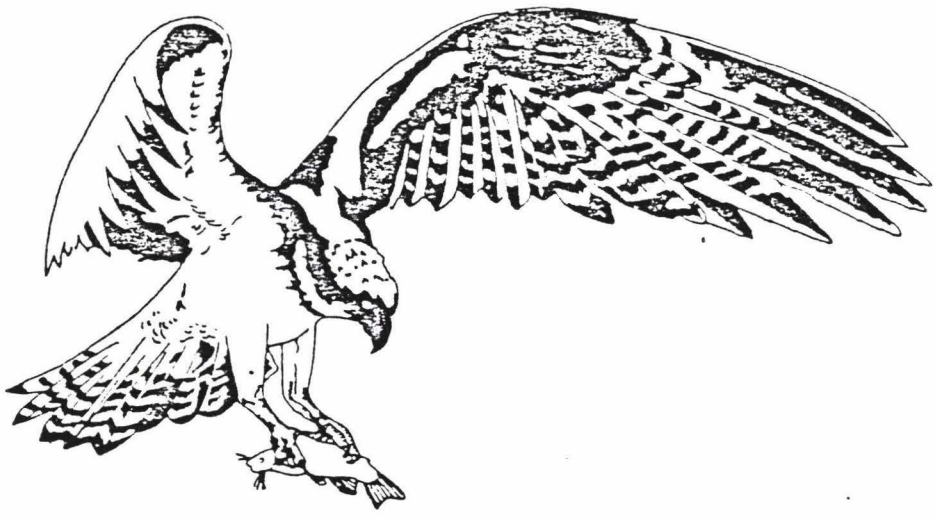
2. Determine desired regional wildlife and fish population or harvest levels, habitat objectives, and species distribution in cooperation with State fish and wildlife agencies. (RF, SD--Oct 1983, annual review)

3. Implement action to improve access associated with all uses of wildlife and fish. (RF--June 1982, annual review)

4. Develop at least one information package describing opportunities for greater enjoyment of wildlife and fish in forest and rangeland ecosystems. (WO, RF--June 1981, annually)

5. Develop, in cooperation with local, State, and Federal agencies and private groups, specific programs to help the public better understand the relationships of wildlife and fish to their habitats. (RF, SD--June 1982)

6. Determine the economic and other social values of wildlife and fish produced on forest and range lands. (Chief--Sept 1981)



NATIONAL OBJECTIVES

GOAL 1b - ACHIEVE ECOSYSTEM MANAGEMENT OBJECTIVES

Explanation

Each management activity carried out influences and is influenced by every other change in the environment, whether brought about by nature or man's action. The management of wildlife and fish habitat is no exception. In order that the interacting effects of the many Forest Service programs can be better understood and dealt with accordingly, activities must be planned in a mode of ecosystem management concepts. The following objectives, pertaining directly to wildlife and fish habitat, are intended to promote these concepts.

Objectives

1. Develop Forest Service policies and national direction for species and habitat diversity. (Chief--Sept 1980)

2. Determine specific wildlife and fish habitat diversity objectives. (RF, SD--June 1983)

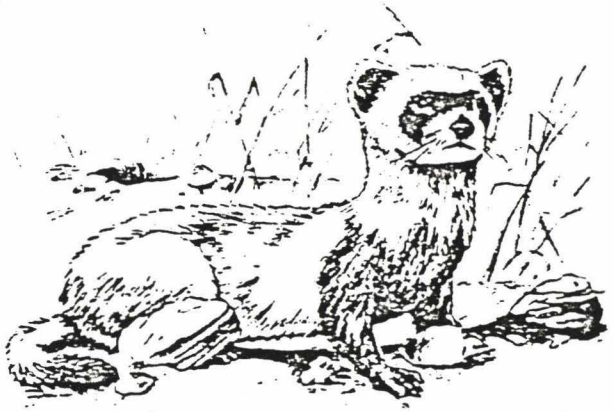
3. Establish a process for regional identification of "management indicator species" (as described in Section 6 Regulations implementing the National Forest Management Act), the groups of species and habitats for which they are indicative, and their responses to management activities. (Chief--Sept 1980)

4. (a) Develop a Forest Service national classification system for aquatic and terrestrial habitats. (Chief--June 1981)

   (b) Implement wildlife and fish habitat classifications consistent with the national system. (RF, SD, AD--Dec 1981)

5. Develop, in cooperation with State and other Federal agencies, the relationships of wildlife and fish to their habitats, utilizing species-habitat concepts such as contained in "Wildlife Habitats in Managed Forests: The Blue Mountians of Oregon and Washington," 1979, Agr. Handbook No. 553 (RF, SD--Sept 1982)

6. Implement, in cooperation with State wildlife and fish agencies, a program to monitor population trends of management indicator species and to determine the relationship of management indicator species to habitat changes. (RF, SD-- June 1982)



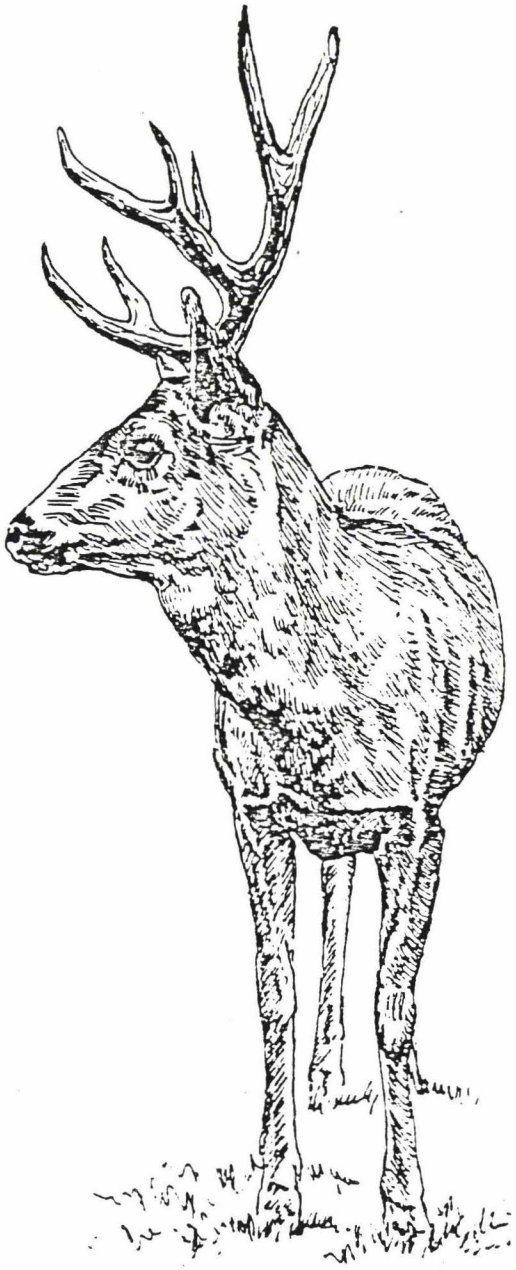
7. Include guidelines for comparing wildlife and fish habitat opportunities and landowner objectives in all cooperative program reviews. (RF, AD--Dec 1980)

8. Develop (a) national output-oriented objectives for wildlife and fish based on habitat capability, and (b) improved measures of quantity and quality outputs. (Chief--Sept 1980)

9. Develop a data management system for national and regional wildlife and fish information. (Chief--April 1981)

10. Identify wildlife and fish inventory data needed for management. Gather and store these data. (RF, SD--June 1981, annual review)

11. Review cooperation with State wildlife and fish agencies and analyze with them the need for separate agreements at the Forest Supervisor level. (RF--Dec 1980)



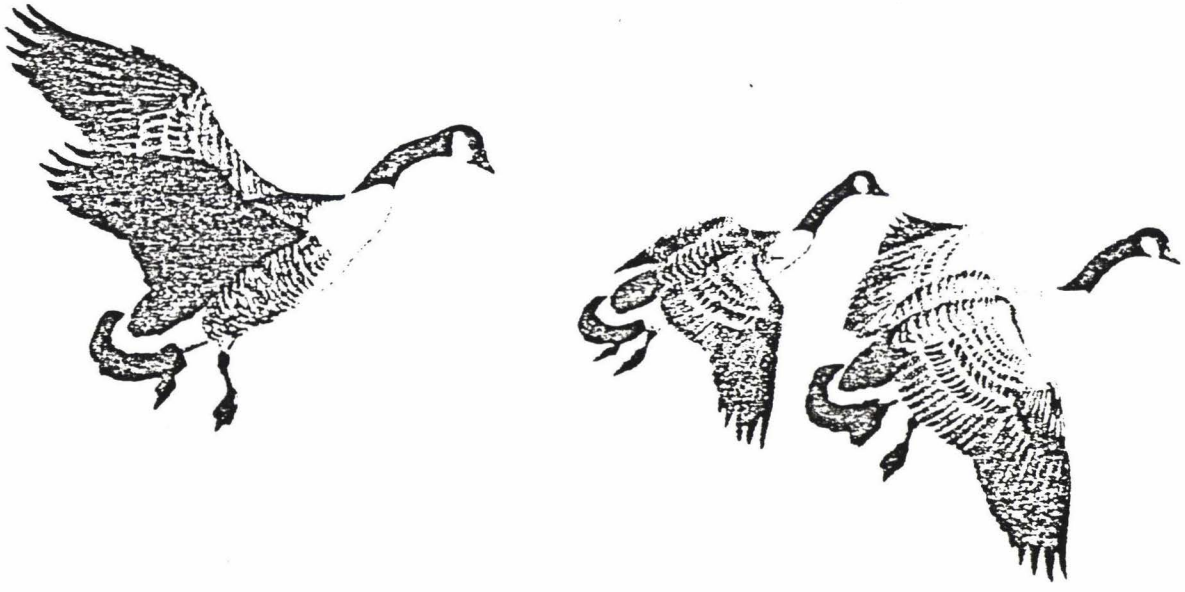
GOAL 1c - ASSURE THAT SPECIES REQUIRING SPECIAL HABITATS DO NOT BECOME THREATENED OR ENDANGERED BECAUSE OF MAN'S ACTIVITIES

Explanation

Many wildlife and fish species are adaptable to major changes in habitat conditions with minor influence on their overall populations. Others are less tolerant to change and, consequently, serve to indicate the effects of management activities on other less tolerant species that inhabit the same biological community. These sensitive species will be given special attention in land and resource management plans.

Objective

1. Identify species with special habitat needs that may be influenced by management programs. Define the quantity and quality of habitat required to manage viable populations of these species. (RF, SD--Dec 1983)



NATIONAL OBJECTIVES

GOAL 2 - IMPROVE THE STATUS OF THREATENED AND ENDANGERED SPECIES TO A POINT WHERE THEY NO LONGER NEED THE PROTECTION OF LISTING IN THE FEDERAL REGISTER UNDER THE ENDANGERED SPECIES ACT

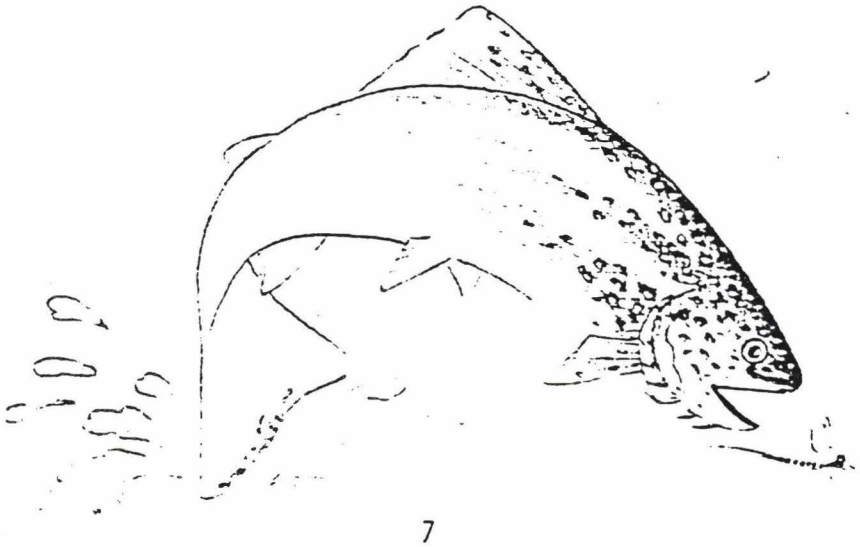
Explanation

Management of threatened and endangered plant and animal species and their habitats is a national concern expressed by Congress in the Endangered Species Act of 1973, and similar State legislation. Management decisions which affect these species will require coordination with the Fish and Wildlife Service and other Federal and State agencies, as appropriate. Some State agencies have established lists of threatened and endangered plants and animals. The following management direction applies to Federal and officially listed State species, recognizing that State listed species may not necessarily require the same degree of resource management constraints as Federally listed species.

Objectives

1. Determine, in cooperation with appropriate State and other Federal agencies, the occurrence and distribution of listed plant and animal species on lands affected by Forest Service programs. (RF--Dec 1980, annually)

2. Describe essential habitats for plant and animal species identified on State and Federal lists. Prescribe management direction for those habitats in land management planning. (RF--Dec 1980, annually)

3. Determine the use, condition, and trend of essential and critical habitats of State and Federally listed plant and animal species in cooperation with appropriate State and other Federal agencies. (RF--Dec 1981, continuing)

4. Review Rural Forestry Assistance programs with appropriate State and Federal agencies to assure that planned management activities conform with the intent of the Endangered Species Act. (RF, AD--Oct 1980, annually)